agroborealis

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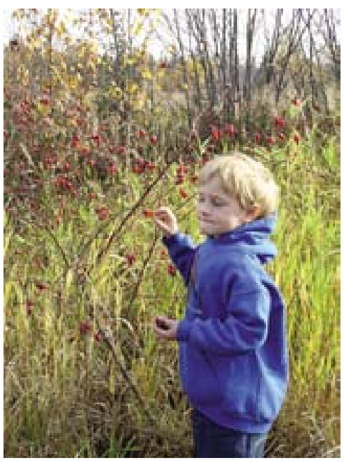
100 years of farming

Controlled environments

Tea time in Alaska

School of Natural Resources and Agricultural Sciences • Agricultural and Forestry Experiment Station
University of Alaska Fairbanks

Greenhouse tomatoes have been grown in the Tanana Valley since before the 1920s through the present day. New techniques and technology are making this delicious crop even more productive in Alaska. See story on p. 27.
—PHOTO BY MERIAM KARLSSON



Cameron Bauer harvests rosehips for herbal tea near Haines. See story on p. 34.
—PHOTO BY ERIKA MERKLIN

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The Controlled Environment Agriculture Laboratory is a new facility at the Fairbanks Experiment Farm where temperature, humidity, and light can be precisely controlled to determine their effects on crops. See story on p. 26.
—PHOTO BY MERIAM KARLSSON

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Associate Director G. Allen Mitchell

Alaska's economic history is a tale of boom-bust cycles: the lure of whales drew hunters to Alaska's seas; the lure of wealth from beaver pelts prompted the Russians to settle her southern coasts; gold miners flocked to her interior regions; World War II brought an international military presence to take advantage of her strategic location; fishers found her salmon off coastal waters. Eventually, explorers and developers brought her black gold, oil, to consumers around the world. Each wave of explorers and developers added their legacy to Alaska, evident in family geneology, community heritage, and industrial and transportation infrastructure. Throughout the years, booms and busts in agriculture, forestry, and natural resource management have also occurred as people sought sustenance—food and shelter—from Alaska's lands.

Attempts to mitigate Alaska's boom-bust economic cycles, including the traditional pursuit of agricultural enterprises that was prevalent in the 1960s through the early 1980s, have incorporated the research, teaching, and outreach programs pursued by the Agricultural and Forestry Experiment Station and the School of Natural Resources and Agricultural Sciences at the University of Alaska Fairbanks, the land grant component of the University of Alaska system.

Because people and their needs have changed throughout the United States, the word *agriculture* is now understood to include multiple resources, communities, the environment, and people. The tripartite activities of land-grant institutions can no longer be limited to rural regions and traditional agriculture and forestry, but must encompass concerns common among metropolitan areas, rural areas, and the smallest and most remote villages. This requires a multidisciplinary approach that bridges research, education, and outreach and addresses healthy people (nutrition, disease control, food safety), a healthy environment (energy, renewable resources, soil, water), and a healthy economy (sustainable growth, technology transfer, new products, knowledge).

Historically, such an approach has been central to our work. During 2006, we celebrated the centennial of the Fairbanks Experiment Farm, and some of our history is related in this issue. Since the experiment station was established at Sitka in 1898, seven experiment farms have been associated with it; today the Matanuska Experiment Farm (established 1915) and the Fairbanks Experiment Farm follow the land-grant mission and reflect the new definition of agriculture as we serve Alaskans. Even as we mark past accomplishments, our attention is on the future and the work yet to be done. This issue reports on th ree main areas: reindeer meat quality, controlled environment crop production, and small farm viability. Our graduate and undergraduate students are always a part of our research, instruction, and outreach. We would be remiss if we did not highlight their contributions. Thus, two stories are about student research.

Our focus on people is embedded in our history, today's work, and our planning for the future. We depend on you to help us in these efforts and hope that *Agroborealis* helps you in your daily lives and business ventures. Continuation of our work depends on funding from the state of Alaska, the U.S. Congress, and the grants and contracts our researchers obtain. All are directed to serving you, our clients and friends. We are always interested in hearing from you and talking with you about ways we can cooperate and perhaps partner to continue this valuable support. To learn more about us, visit our publications page at: www.uaf.edu/snras/afes/pubs/index.html. Our annual report covering our 2005 research is now available and we invite your comments and input.

Sincerely,
Carol E. Lewis
Dean and Director

G. Allen Mitchell
Associate Director

Tanana Valley farming: yesteryear's crops

The practice and science of agriculture take root in Alaska's Interior

Although the lure of gold drew many to the Tanana Valley, it wasn't long before newcomers started asking what the land might produce in the way of something more basic to survival—food. During the Fairbanks Experiment Farm's centennial year, two publications commemorate the hard work of the agricultural pioneers of the Interior, on homesteads and gardens in the Tanana Valley and in the fields at the Fairbanks Experiment Farm, which is part of the Alaska Agricultural and Forestry Experiment Station. The Fairbanks research site was established in 1906 at the request of interior Alaska residents. Originally a federal installation, it later provided land for Alaska's first college, to which experiment station ownership was transferred in 1931.

Investigating agricultural potential: 1897 to 1905

(Excerpts from "Throw All Experiments to the Winds": Practical Farming and the Fairbanks Agricultural Experiment Station, 1907-1915, a senior thesis by Rochelle Lee Pigors, former student in the University of Alaska Fairbanks School of Natural Resources and Agricultural Sciences. Published on the Internet as ST 2006-01 at uaf.edu/snras/afes/pubs/SeniorTheses/ST_06_01.pdf) Note: See original for full citations and notes.

Agriculture in Alaska has developed slowly and still plays a small role in Alaska's economy, even though the federal government established the first experiment station to investigate the possibility of Alaska agriculture nearly a century ago in 1898. Land for the Fairbanks station was surveyed in 1905 and the station was officially opened in 1907, with the mission of determining whether "farming could be made to pay in the Tanana Valley."[1]

…. Alaska was considered a strange, desolate wasteland, or so many people believed when the United States purchased the territory from Russia in 1867. Judging by the chronic food shortages of the Russians and the harsh climate, few thought any form of agriculture could succeed there. One skeptic queried in 1875, "can a country be permanently and prosperously settled that will not in its whole extent allow the successful growth and ripening of a single crop of corn, wheat, or potatoes, and where the most needful of any domestic animals cannot be kept by poor people?"[2]

Some people thought that a limited amount of agriculture was possible, but certainly "no sustained or widespread agriculture was envisioned by anyone prior to the mid 1880s." With the influx of fishermen and especially gold miners to the Klondike Gold Rush of 1887, however, the attitude towards the agricultural possibilities in Alaska became more optimistic.[3]

In 1897 Congress authorized the Secretary of Agriculture to spend $5,000 investigating the agricultural resources of Alaska. Thus, in the summer of 1897 the botanist of the Office of Experiment Stations, Dr. Walter H. Evans, toured the coastline from Prince of Wales Island in the southeast corner of Alaska to Unalaska on the Aleutian island chain "to investigate the agricultural and horticultural possibilities of that country." The soil's high content of organic matter, which surpassed that of any cultivated land in the rest of the country, led the analyzer to state that "if these soils are…well drained, they should be capable of producing enormous crops." Dr. Evans concluded that, although he was skeptical of Alaska's capacity to produce enormous crops, he believed enough produce could be grown to make the territory self-sufficient.[4]

During that same summer of 1897, the Secretary of the Interior commissioned Dr. Sheldon Jackson, the Superintendent of Schools in Alaska, to assess the agricultural potential of the Yukon River Valley in conjunction with his annual inspection of the reindeer stations and schools, and Benton Killin of Oregon to make observations of the status of and potential for agriculture along the coastline of Alaska.[5]

Presented with promising reports, Congress appropriated $10,000 for the fiscal year of July 1, 1898–June 30, 1899, to continue investigations into Alaska's agricultural potential, authorizing the establishment of stations at Sitka, Kodiak, and Kenai. The Secretary of the Interior decided to transfer professor Charles Christian Georgeson from his post in the Division of Agrostology in the Department of Agriculture to the position of Special Agent in Charge of Alaska investigations. A native of Denmark experienced in agricultural research,

The Fairbanks Experiment Farm in 1908. Groundclearing began in 1907 and the station's structures were quickly built.
—Experiment Station Collection, Rasmuson Library Archives Accession #1968-0004-01217

Georgeson was fully acquainted with agriculture in northern climates. His instructions for that first year of investigation included the following: begin controlled experiments at the headquarters in Sitka, testing varieties of cereal grains, vegetables, fruits, and methods of cultivation suitable to the area; experiment with silos for curing and storing hay and produce for winter use; contact residents in various areas and provide seed to those who were willing to experiment with plant varieties under his direction, and to report the results to him; and tour the coastline in search of potential sites for experiment stations and continue investigations into the Interior, if time and means allowed.[6]

The results from the first year were promising. Despite late planting, the vegetables in Sitka did extremely well on previously worked ground and all the cereal grains matured. As expected, crops did poorly on newly farmed ground, which required liming to reduce soil acidity. Georgeson received many replies to his requests for agricultural information. Most respondents discussed their success with garden vegetables and flowers and their somewhat limited luck with grains. Of livestock, dairy cattle seemed the most plentiful and were said to be doing quite well on the native grasses of the coastal region.

In one very brief reference to the Interior, Georgeson stated that it offered greater possibilities than the coastal region and would surely grow the more hardy cereal grains, such as barley, oats, and buckwheat, along with the vegetables reported by his correspondents. He noted the difficulty in reaching this country, however, and realized investigations into agriculture there would be delayed until roads and railroads reached it.

Based on the successes of the investigations of 1898, Congress increased Alaska's experiment station allotment to $12,000 to "establish and maintain agricultural experiment stations." With the official establishment of federal experiment stations, Alaska had finally received congressional recognition as an agriculturally viable member of the United States.[7]

Georgeson expanded and staffed these first agricultural stations in Alaska and opened interior stations at Rampart on the Yukon River in 1900, and at Copper Center on the Copper River in 1901.… The station at Rampart was intended to explore the possibilities of agriculture in the far northern areas of the Alaska Interior; there were great hopes that the Copper Center station would become an agricultural mecca in the Copper River Valley. Georgeson proclaimed that perhaps it was "the most favorable locality for agriculture in all Alaska."[8] The luxurious grasslands and plans for a railroad through the town of Copper Center to serve the copper mines made this spot seem the perfect place to develop Alaska's agriculture. When the railroad brought more affordable transportation and the homesteaders rushed in, it was reasoned, Alaska's agricultural development would begin and the territory would be on its way to self-sufficiency. Reality did not cooperate with these plans, however. The unfavorable early frosts and lack of rain discouraged agricultural hopes, while the passing of the railroad over forty miles away from Copper Center frustrated dreams of a thriving railroad town.[9]

As it was becoming clear that the Copper Center station was not the agricultural success it was hoped to be, Fairbanks presented an opportunity to redeem Alaska's poor agricultural reputation. The Fairbanks citizenry had felt the need for more organized investigation of their agricultural situation and had petitioned Secretary of Agriculture James Wilson to establish an experiment station somewhere in the Tanana Valley. Eager for the opportunity to test agriculture in another area of Alaska, Georgeson and Fred E. Rader, the assistant at Rampart, arrived in Fairbanks on July 28, 1905. They spent three days searching in all directions from the town of 3,000 people.

Most homesteads near the town had been taken up… Georgeson considered locating the station farther up the Tanana River in the Delta district. Fairbanksans quickly quelled this notion, however, as "members of the Chamber of Commerce and others used their influence" to direct him to areas between Fairbanks and the nearby town of Chena.[10] Georgeson finally decided on 1,393.97 acres along the Fairbanks-Chena railway that connected the towns to the gold diggings in the hills. The tract contained two low ridges about a mile apart running west to east with an unnamed five-acre pond and the twenty-five acre Smith Lake lying between them. He cited the presence of the railroad on the south side of the tract as a way to avoid the troubles of transporting supplies that plagued the Copper Center station, and noted that the large population, which included an estimated 10–12,000 miners in the surrounding hills, would justify the need for improved plant varieties and methods of agricultural production.[11] Georgeson's next task was to find a proven and capable superintendent, for Georgeson planned that this station would demonstrate "the possibilities of farming in Alaska."[12] An ambitious goal for one station, but who should attempt it? He had several prospects from those graduating from his old employer, Kansas State University, but Georgeson already knew who he wanted.

§

J.W. Neal, the experiment farm, and the Tanana Valley Agriculture Association: 1906 to 1917

In the "hills north of the Tanana bottoms is found the best soil seen in Alaska."

—United States Department of Agriculture1

Excerpts from Like a Tree to the Soil: A History of Farming in the Tanana Valley, 1903 to 1940*, by Josephine E. Papp and Josie A. Phillips. See original for full citations and notes. In press, 2006. (Contact AFES on availability at fynrpub@uaf.edu.)*

Before the turn of the century, the United States Secretary of Agriculture sent a number of researchers to Alaska to find out just what the lands could grow. The first positive agricultural observations (well known to those living in Alaska), were of the natural grasses, red top grass, and marsh grasses along the rivers that were cut and sold as horse fodder to the military and miners. Also noted was the large amount of grain roadhouse operators grew and the successful gardens they raised to feed their guests….

J.W. Neal, one of the researchers, arrived in Alaska in 1896. In 1903, as Assistant Superintendent at the Copper Center Agricultural Experiment Station, Neal noted the successful planting of oats and barley. The impressive results prompted him to pack sixteen bundles of ripe barley to the coast and have it shipped to Washington, D.C. That shipment went on to decorate a 1904 exhibit at the St. Louis Louisiana Purchase Exposition.

A September 1903 issue of *The Weekly Fairbanks News* quoted one Fairbanks resident, George Harrington, soon after he harvested his beautiful and bountiful garden. "Little reason our vegetable supply can't be home grown," he said.[2]

A July 1906 newspaper article in the *Fairbanks Evening News* stated that 200 acres were under cultivation that summer,

Building the road across the Fairbanks Experiment Farm. The scraper is being drawn by an early 60-horsepower tractor.

—Agricultural Experiment Station Photo Collection, Accession #1968-0004-01652, Archives, Alaska and Polar Regions Collections, Rasmuson Library, University of Alaska Fairbanks that the oats, timothy, and wheat crop were excellent, and that the vegetable harvest would be notable. Also mentioned were two men who had brought a wagonload of hay through town, explaining that fine natural growths of hay could be found all around Fairbanks, free to whomever harvested it. Men in the freight business cut the hay to feed their better horses. Wild hay cut and sold by local hay dealers went for eight cents a pound in 1904. Sold in Fairbanks or rafted downriver, it became an adequate cash crop. A Fairbanks dairy in 1911 bought wild hay for $75 a ton, about half its 1904 cost.[3]

For the U.S. Agricultural Experiment Station Tanana Valley site, Georgeson selected Ester Siding along the Tanana Valley Railroad, just south of the present-day Fairbanks Experiment Farm and its Georgeson Botanical Garden. Other Alaska stations were at various times located in Sitka, Rampart, Copper Center, Kenai, Kodiak, and the Matanuska Valley. Each farm began testing varieties of vegetables, grains, and fruits suitable to climate and locations. In his lectures and writings, Georgeson aggressively promoted the idea that agriculture was possible in Alaska. He estimated that 100,000 acres were suited to dairy, grain, and potato production, and he strongly maintained that seed production could be a large industry in Alaska.

In the spring of 1907, Superintendent J.W. Neal began clearing land at the Ester Siding farm site. Not only was land cleared that spring, but thirty-two varieties of potatoes were planted. The Sitka station planted forty-six varieties of apples and crabapples. The experiment stations' mandate to conduct research was underway.

The arrival of new equipment at the Fairbanks Experiment Station interested the farmers as well as the community. A new threshing machine arrived in 1913, a horse-powered Ellis level tread thresher, an important acquisition at the expanding farm. The focus of the station personnel by then was to produce grain seed in quantity enough to send some Outside, for it was believed that northern seed was the best. Secondly, a Siberian strain of alfalfa that showed promise was to be studied. It had survived the winter, although the plants needed more insects to pollinate them adequately. The third item on the list was potatoes. Better varieties were needed for the Interior, so testing continued. The 1913 crop of potatoes was so unsatisfactory that it was used to feed the pigs, probably because the tubers were watery, misshapen, split, or had second growths that made them unappealing.

In August 1913, Professor Georgeson and Colonel W.P. Richardson of the Alaska Road Commission arrived at the station very annoyed. It had taken them thirty-eight minutes to drive from Fairbanks to the station on the terrible Ester road. Visitors were coming regularly to the farm and it should not take thirty-eight minutes to make the trip, the two argued. Three years later, $10,000 was budgeted by the road commission for the four miles of road with the hope of turning the awful muddy road into a "boulevard." The year the road was upgraded, 1916, twenty men were employed at the station.

J.W. Neal at the Fairbanks Experiment Farm, circa 1917.
—Experiment Station Collection, Rasmuson Library Archives Accession #1968-0004-01212

Shortages of food staples, meat, grain, and hay, as well as wood, were serious happenings in Fairbanks. Those folks who had been in the Interior for any length of time recalled the cold winter of 1897–98 when Dawson was low on supplies and how critical it became. Cordwood was in short supply in Fairbanks briefly in the fall of 1909, but wood cutters and haulers needed only to move farther from town to cut timber. Again the woodlots of Fairbanks became very low the spring of 1916. Once more, local woodsmen were able to alleviate the shortage by going out to get wood and finding a way to transport it to town. Reassurance that the problem was being solved by suppliers, such as Independent Lumber, soothed the users of cordwood.

On May 7, 1913, H.B. Parkin of Fairbanks Meat Company alerted the *Fairbanks Daily News-Miner* that he only had a two-week supply of meat remaining. Five days later, the *News-Miner* headline read: "Meat Supply About Gone". The locals had quickly filled their larders. Without success, town leaders requested Governor Clark to have the game laws changed for a short time. Livestock was immediately shipped from Yakima, Washington, but it would take weeks for the cattle to arrive in Fairbanks. Good news came on May 23. The cold storage steamer Robert Kerr was underway from sister city Dawson with meat. June 2, H.P. Parkin reported the meat shortage was nearly over, for at Hot Springs (now Manley Hot Springs) were 200 cattle destined for Fairbanks supper tables.

The *News-Miner* reported April 5, 1916 that the food stores were once again getting low on staples. On April 19 one of the town's most reliable teamsters, William Terrill, arrived in Fairbanks with a load of goods for the market. Terrill received a "royal welcome," for he eased the "grub shortage."[4] The first boat of the year, the Delta, also arrived to a large welcoming crowd on May 25 with supplies for both man and beast. The Northern Commercial (N.C.) Company reported there were only three bags of oats left in their warehouse. All the feed dealers were out of horse feed. The community had weathered the crisis again.

Before the arrival of the first boat in May 1917, Fairbanks was again "running shy on its meat."[5] There was canned meat

Horses and grain at the Fairbanks Experiment Farm.
—Albert Johnson, Rasmuson Library Archives Accession #1989-0166-0423

and chicken available, but the town was extremely short of wild meat. The Commercial Club again asked for permission to hunt more caribou. This problem needed to be solved.

The community was growing rapidly through these years. 1915 had been a decent enough year for farmers. Bins and shelves could be filled with foodstuffs. Potatoes were advertised at one dollar for fourteen pounds. Golden Market had fresh beef and moose for sale, as well as 1,500 chickens that would be killed to order.

As winter set in, a grave problem became evident, one that touched everyone owning livestock, and horse owners in particular. The number of horses had increased greatly with the growth of the human population. The N.C. Company brought in an oat crusher in 1915 that was said to improve horses' digestion of grain by thirty percent. There was a serious shortage of horse feed during the winter of 1915–16 and as the shortage increased, it grew close to catastrophic. The grocery manager for the N.C. Company reported that hay was in short supply and that the teamsters were desperately looking for horse feed. His suggestion that horses could eat surplus potatoes became a reality, as supply boats would not arrive until breakup. Owners of horses began to feed the animals potatoes and carrots. Some horses were moved downriver to Hot Springs where the shortage was not so great. Farmers used their precious grain seed to feed their livestock. Loss of livestock was averted by these actions, but in the spring of 1916, there was an acute shortage of grain seed to plant.[6]

The Fairbanks station had been raising seed for five years and that spring had 1,100 bushels of wheat, rye, barley, oats, and buckwheat seed in storage. Superintendent Neal asked for and received permission to advance seed to farmers, with the promise that they repay in kind, pound for pound of loaned seed after the fall harvest. The government thresher would be made available to the farmers for recovering seed. His goal, Neal said, was for the farmer to become "independent, in respect to horse feed at least."[7] A loan of 10,000 pounds of seed was made to thirty-two farmers. To the credit of all, every pound the farmers borrowed was returned to the station by January 25, 1917. This was a great success for the entire agricultural community and surely encouraged the 'we can grow it' attitude of those years. J.W. Neal was greatly respected by the farmers as a leader, a problem solver, and a good friend.

With seed production in mind, the station produced 260 pounds of turnip seed in 1916. This seed was sent to Sitka for distribution to other experiment stations.

Away from the experiment station, the land was being settled and farms were taking shape. It was a much slower process on the homestead than at the station because there was a lot less manpower, little equipment, and often insufficient funds. However, there was no less determination and planning.

The first dozen years of farming in the Tanana Valley primarily involved a large mix of men and women from many countries who had come north following various gold strikes. By 1906, that quest had diminished for many when no pot of gold was found at the end of the rainbow. Farming took on greater appeal, and the need for land became urgent as the change from miner to farmer was made. Many farmers could have been termed squatters in the early years, for the majority did not make formal application for land until 1914 when the surveying of federal land got underway.

The amended Homestead Act of 1900 met the needs of most, for it allowed any United States citizen who had reached twenty-one years of age to settle on unsurveyed land in Alaska, select up to 320 acres, lay out their own lines and file the necessary paperwork. The act was again changed in 1916, when the maximum size for a general homestead was lowered to 160 acres. Grain producers were still allowed to homestead 320 acres.

Statistics of agricultural achievement in the Interior for 1912 noted 46 growers of garden and farm products that were worth over $100,000. The potato crop alone was valued at $28,000. Quantities of items grown were: potatoes, 280 tons; cabbage, 69 tons; carrots, 32 tons; tomatoes, 16 tons; peas, 1 ton; beets, 4 tons; onions, 1 ton; grain, 8,150 tons (oats, barley, and wheat); oat hay, 223 tons; red top hay, 5 tons.

There was increased interest among some growers to coordinate their efforts and together find markets for their products. Nine farmers made the first attempt to organize themselves in April 1913. They were Mel Sabin, Bert Johnson, Daniel Henry (Harvey) Hanford, Dan Berger, Henry Riddle, Richard May, John Downs, G.G. Berg, and P.J. Rickert. With the aid of the Fairbanks Commercial Club, the Tanana Valley Produce Growers Association (TVPGA) was formed. The group set goals and developed guidelines using the bylaws from the Wenatchee Washington Fruit Growers.

The first goal announced by the group was to save the "camp $40,000." Instead of buying grain and produce from Outside, they would grow them in Fairbanks.[8] Efforts were made to enlist twenty-five to thirty more farmers to join the association, because the economic commitment of that number was needed to make the group viable. By June, the farmers had determined how crops were to be sold. Each would sell his own crop at a price set by the association. With optimism, the farmers selected officers and a warehouse man.

The eruption of Mount Katmai in June of 1912 left its mark on Alaska in many ways. The weather the summer of 1913 was not good for growing produce and the young organization struggled. Growers fell behind with their crops and then came the deadly blow of cold temperatures and snow on August 27, which completely ended the season. Even the annual fair, so carefully planned, was canceled. There would be no bragging of accomplishments in 1913.

Alaska's delegate to Congress, James Wickersham, sent copies of farming and stock raising bulletins to Fairbanks for P.J. Rickert to distribute. These bulletins covered a wide range of ninety-two subjects. Large quantities of sugar beet seed also arrived for free distribution in both the Tanana and Matanuska valleys, as Wickersham was certain it was a feasible crop. He pledged to do his utmost to promote agriculture and one way he did this was by sending a vast assortment of flower and vegetable seeds each spring.

To encourage the growing of grain in the Interior, Falcon Joslin of the Tanana Valley Railroad distributed free grain seed that he had acquired from an experiment farm in Sweden. Oats, barley, and rye usually matured in the Tanana Valley; wheat was less sure. The Fairbanks Experiment Station continued to improve the likelihood of a wheat crop….

Although the fledgling association continued to flounder, agriculture had two bright spots in 1915. That fall four tons of produce were sent to Ruby, Fort Gibbon, and Iditarod. The growers and the American-Yukon Navigation Company agreed on lower shipping rates on produce for that shipment only. Potatoes sold that fall for three to four cents per pound.

The second high point was the 1915 fair. The displays of produce were described in the newspaper as the "greatest ever."[9] In fact, they were so outstanding that many exhibits were sent to San Francisco for the Panama Pacific International Exposition where they amazed visitors as much as they had the locals back home. A golden heart was designed of wheat, oats, and rye straw with letters made of grain. The heart became the keystone of the agricultural exhibits shipped south. Many of the displays were immortalized by photographer Dick Thorne. The Pacific Coast Steamship Company provided free transportation for the exhibit in honor of the forty-eighth anniversary of Alaska's purchase by the United States….

The idea that the community—Fairbanks and the surrounding area—could be self sufficient in its food supply had been germinating for some time. The farmers had demonstrated their ability and resolve to produce. In 1917, eight Fairbanks businessmen who called themselves "The Alaska Loyal League" gave the farmers a big boost needed to strongly organize and in turn market their products. The League included R.C. Wood, banker; W.F. Thompson, newspaperman; A. Browning; Harry E. St. George, real estate agent; Northern Commercial Company manager George Coleman; merchants E.R. Peoples and F.S. Gordon; and H.B. Parkin, Fairbanks Meat Company transportation agent. Of one mind and committed to providing the infrastructure necessary for the idea to grow, the men made public their daring, unique, and significant idea.[10]

With farm leaders and the staff of the experiment station, the Alaska Loyal League planned in great detail a "Farmers' Day" for April 28, 1917. For this extraordinary day 108 invitations were sent by mail to those that had applied for land or had received land and lived within one day's travel of Fairbanks. The invitation was printed in the *News-Miner* as well. "Farmers' Day" was to include lunch at the Nordale Hotel followed by an afternoon convention at the courthouse.

A fine luncheon was served that April noon. The staff of the Nordale Hotel set 180 place settings around a horseshoe-shaped table. The menu card, which was also a souvenir for each person attending, listed the following luncheon dishes and courses: Oyster Cocktail; Relishes—Green Olives, Sweet Pickles; Salad—Crab on Mayonnaise and Lettuce; Meat—Young Turkey with Apricot Jelly, Ox Tongue, Prime Ribs of Beef, Westphalia Boiled Ham; Dessert—Roman Punch Macaroons, Wafer Crackers Cream Cheese, Café Noir.

Judge Bunnell was seated at the head table, which suited one farmer in particular. This farmer was said to have commented that if Judge Bunnell was not there he "won't be either." In what now seems an amusing aside, the newspaper write-up mentioned that Judge Bunnell was "an authority on sheep shearing and mule skinning,"[11] which perhaps he was.

The town leaders pledged to support Tanana Valley agriculture. The federal representatives promised financial aid. The large agricultural group concluded its luncheon discussion and left the hotel for a group picture taken by Fairbanks photographer A.J. Johnson. Everyone then moved to the courthouse where the farmers settled down to hear the Alaska Loyal League outline specifics of a plan for making the Tanana Valley self-sufficient in terms of agriculture. The plan would work if there was a coordinated effort by farmers and town leaders. This longtime idea could be more than a dream, they were told, it could be a reality. This was the thread of all discussions that afternoon.

Superintendent Neal of the experiment station emphasized the need to work together to get better overall results. The farmers listened to this man who had earned their great respect.

It was disclosed that a Farmers Bank had been organized and would open in early May—or as soon as the paperwork was returned from Juneau. The bank was to be organized with $50,000 capital stock. Principal investors were Clarence Berry, living in San Francisco, H.E. St. George, P.S. Whitney, and Wallace Cathcart. The officers of the new bank were President H.E. St. George and Vice President and Cashier Wallace Cathcart. The directors were Clarence Berry, P.S. Whitney, and Guy Erwin. The bank would operate from the Washington-Alaska Building at the corner of Cushman Street and Second Avenue. Low-interest loan money would be available to the farmers. The bank would buy gold dust, administer estates, forward money, and accept deposits.

The support that the community leaders promised was to create a stable market for crops. In turn, the town leaders would depend on the farmers to provide for the needs of the town and the outlying mining camps. The farmers were told that today: "merchants and residents of the camp are ready 'to a man' to favor the local farmer and work for him, but don't gouge and lose support of the community."

At the conclusion of that full day of food, discussions, and proposals, the Tanana Valley Agriculture Association was born. Fifty-one (four-fifths of those attending) became charter members, pledging to make Alaska agriculture succeed in the Interior. It was decided that Harry Busby would act as temporary president and that Harry Bentley would take on the duties of temporary secretary. Together, an economic commitment had been made that could work.

The flame of inspiration burned brightly the next months. T.D. Crippen, who had been superintendent of the Rampart Agricultural Experiment Station, was now assistant to Neal at the Fairbanks station. Crippen met often with the new organization. He informed the farmers that equipment from the station would be made available to them, equipment such as several self binders and a threshing machine. A small flouring mill was there at the station for them to use as well.

The businessmen aided the farmers in obtaining contracts for selling potatoes and vegetables. Newspaperman Thompson began listing the prices of Outside produce on a regular basis as a price indicator for the newly formed group.

As the weeks went by, the farmers in the new organization gained confidence and as a group expressed what they needed help in acquiring. The first request was directed toward the Road Commission; there was a pressing need for better roads to the farming areas, a need not quickly alleviated. As late as June 15, 1945, a newspaper account asserted that only Alaskan Cranes, or Sandhill Goopers, were guaranteed of getting around Farmers Loop.[12] There were several land-traps awaiting unwary autos. That winter had been a big snow year and Mr. and Mrs. Fowler, who lived along the road, reported being snowbound until they snowshoed to a cleared road. Each spring breakup, until the road was paved in the early 1960s, there were treacherous areas for travelers to ford.

The Farmers Bank opened mid-July 1917 ready for business. Unfortunately, it was a short-lived endeavor, for it closed two years later, September 8, 1919.

The TVAA members were established with a constitution and bylaws, and they acted as a unit. Markets were available for a variety of produce, which allowed the growers to be diverse and to no longer concentrate on potatoes only. Growers were satisfied that locally grown vegetables were being served in the restaurants that summer and the military was to purchase 60,000 pounds of potatoes that fall. The crop looked promising and would surpass the 1,900 tons produced in the Tanana Valley in 1915. Outside, a transcontinental railway planned to feature "Alaska's Great Big Baked Potatoes" in the dining car. Each potato was to weigh at least a pound and a half. The Alaska Engineering Commission contracted for fifty tons of potatoes and fifteen tons of other vegetables in 1917, and upped the quantity of vegetables to ninety tons the following year, plus put in an order for fifty tons of native hay.

Work continued at the experiment stations. With the formation of the TVAA, Superintendent Neal became more of a workhorse. He pledged to the group to use his knowledge of government connections and farm affairs to aid the new group. Neal had always believed Alaska could feed itself and would argue forcefully with naysayers who said agriculture in the Territory was doomed. He held that agriculture was not doomed; it would evolve much as it had in Finland.

Finland had recently declared its independence from Russia and had become a republic. Its chief agricultural crops were rye, barley, oats, potatoes, and hay. There were also dairy farms and fur farms. Only six percent of Finland was agricultural land, but it provided occupations for the majority of the population.

J.W. Neal's many years of dedication to Alaska, his establishment of the Fairbanks Experiment Station, and his genuine interest and support for the farmers gave Tanana Valley agriculture a strong, durable foundation on which to build.

§

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Master of the Farmall tractor

Leigh Dennison

Editor's Note: Leigh Dennison worked at the Fairbanks Agricultural & Forestry Station's Fairbanks Experiment Farm from 1950 to 1956. In 1952 he acquired acreage at Delta Junction, where he and his wife, Hannaelore "Bill" Livingston reside. In 2003 he was honored by the community for thirty-five years of service as a firefighter.

In April 1950 I sold my 1939 Pontiac sedan and bought a 1948 CJ2A Jeep because I had heard about the terrible condition of the Alaska Highway, and I wanted to drive up to Fairbanks at the invitation of a high school friend who came up in a 1948 Jeep truck. I fixed up the Jeep so I could eat and sleep in it by taking out the single right side seat.

I looked in the Rand McNalley Road Atlas of the U.S. and decided to take the shortest road from Lansing, Michigan, to Fairbanks, Alaska, which was through Northern Michigan, Wisconsin, Minnesota, southern Saskatchewan, Alberta, and then northwest into British Columbia, Yukon Territory, and Alaska. This was a shorter route than over into the Dakotas and Montana, but it turned out that in central Canada, the red roads were not all first-class roads. At one place the snow-plow had been abandoned in a section where the traveled lane was out in a field. There were almost no paved roads outside of the larger towns, and after leaving Edmonton there was no pavement until the last three blocks of Fairbanks.

Anyway, in due time I arrived at my friend's little house at 21st and Blueberry in Fairbanks without even a flat tire! The first thing I did was start looking for some work and dropped in at the college experiment station to see what was what. I told the girl in the office that I was an agricultural student in East Lansing, Michigan, and wondered if there might be any chance of a job at the station. I don't remember her name, but she asked around and determined that I might be accepted as an assistant to the agronomist, John C. Brinsmade.* This was not my first choice of work, but Mr. Brinsmade was a very nice man and explained the work to be done, none of which involved any real strenuous exertion. I was physically sound and figured I could probably handle the tasks he described.

That summer I seeded, weeded, and harvested various varieties of seed and feed crops in very small quantities for testing and evaluation. We had a small hand feed threshing machine that was easy to clean out for the next sample. There were two men on this project beside Mr. Brinsmade and I. One was "Doc" Wilder** and the other was a Russian, from where I do not remember. I do remember Doc, who had a late 1940s Studebaker sedan. One time he had it in the shop, jacked up with one corner on a bumper jack. I heard a loud noise from the building. Upon investigation, I found he was seeing how fast it would go. He said it would go something like 100 mph. This was with one wheel in the air, the other on the concrete shop floor, and smoke coming out the door. He may have been an agronomist, but he was not a mechanic!

The Russian lived in one of the three apartments down across the road and railroad in front of the farm buildings. One day I was in his apartment for some reason, and it smelled pretty bad. I learned that he was making "fish soup." This consisted of going down to the end of Chena Pump Road to a fishwheel someone was running there and getting the fishheads, tails, insides, etc. These he put in a #2 washtub up on top of the partition wall in the apartments. This was allowed to "work" for some time and then was made into the soup! I kindly refused every offer to have some.

Garn Osguthorpe was the station manager at the time and a real nice guy. One crop we raised in small quantity was red clover for seed. Mr. Osguthorpe wanted to give some of this seed to Montana State College at Bozeman. Since I was making a trip back to Michigan anyway, I offered to take it. On the way I dropped off some of it at the experiment station at Haines Junction, and they were grateful for the free delivery.

I had gone to Michigan State College after the war to finish my courses for a degree in agricultural engineering. I needed one course in organic chemistry to finish. Garn Osguthorpe kept encouraging me to go up to the U of A. and finish that course. I kept telling him that when I took it at Michigan State, I did not understand any of it, so why waste my time? He was persistent, so one day I decided there was nothing to lose and walked up the hill to ask about it. I ended up signing on for the course. [It differed from Michigan State, where] they had lecture classes of about 100 and lab classes of about 30. If you had any questions you had to get a private tutor; they did not have time to answer questions.

At U of A the class was taught by the head of the chemistry department, a Mr. Wilson, if I remember correctly. He made it plain that if you had any questions, just ask. Wow, what a switch! There were four people taking the course…[myself and two girls taking it for credit, and one GI who was auditing it]. One of the girls was a genius, and the other was taking it as a required course. The genius breezed through it with no trouble. The other girl did not get it, and amazingly, I ended up tutoring her enough to pass the course…the smart girl got the A, I got the B, and the other girl got the C. I was happy!

One time it was decided to rewire the cow barn and get rid of the old wiring. Since I had some wiring experience, I decided I could do it.… About this time the new plastic electric tape came out and it was advertised that one layer was equivalent to two or three layers of the old rubber and friction tape. I made a junction using this new "stuff." One day I came back from town to find a fire truck at the barn. The new tape did not do the job, burned through, and shorted out to the metal box. So much for advertising! I [fixed it], finished the job, and the barn is still standing.

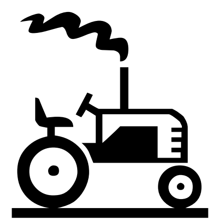
We sometimes had a bit of hilarity. There was a large cat that roamed the farm, and also a medium-size dog of no particular breed…who liked to chase the cat….[Once] the cat was walking down the driveway and the dog…started the chase it.… When the cat stopped suddenly, the dog could not stop as quickly. As the dog went by, the cat jumped on its back, dug in with all four feet full of claws, and hung on. The last I remember seeing was the dog yelping down the drive with the cat having a merry ride!

One of my jobs was hauling coal from the Fairbanks Coal Bunkers out to the farm to feed the heating system. I have made a lot of trips with the 1.5-ton International dump truck, with a load of coal to dump into the basement coal bin in the dormitory building. The cook for the single men in the dormitory was Rene Douglas, whose husband worked on the farm. She was a very good cook.…[A young male farmworker] liked lemon pie, which he told Rene about. One day she made one especially for him. Of course we all shared it, and it was very good, but he asked her why she didn't put any lemon in it [and] that was the last lemon pie we had while he was there!

One day while Gareth Wright was clearing some land down across the railroad, he pushed out a set of railroad wheels and axle. It seems that the field he was clearing is where the Tanana Railroad used to go across the field south of the experiment station.

Duncan Plowman was the mechanic back then. After he left to tend to his motel on College Road, I took over as the station mechanic, plumber, electrician, etc.

While I was there, the station bought an Allis Chalmers ALL Crop 60 combine and Allis Chalmers tractor. From the junkyard behind the station buildings in the woods, I bought an old Farmall F-20 tractor. I think I paid 25 dollars for the tractor, and the pistons were rusted into the cylinders. With a big hammer and punch, I broke the pistons out of the cylinders. Back then you could buy all the parts from the Glenn Carrington Company right in Fairbanks. Anyway, I completely overhauled that tractor, and it still runs today.



*The agronomist John C. Brinsmade died at the Tucson, Arizona, Medical Center on February 20, 1975, at the age of eighty-three. During his eighteen-year tenure at the experiment station farm in Fairbanks, he worked with small grains, corn, and forage crops. Mr. Brinsmade selected the basic alfalfa lines that with later refinement would become the new variety Denali, and he worked to develop corn that would mature during the short interior Alaska growing season. He recorded weather observations for the Fairbanks station and regularly prepared crop exhibits for display at the fair. Before coming to the experiment station in 1946, Brinsmade worked with flax as a U.S. Department of Agriculture employee in North Dakota. His wife, Ellen graduated from the University of Alaska in 1948 and later was employed there as a teacher. The Brinsmades retired to Arizona in 1964. Mrs. Brinsmade died in 1972 from injuries suffered in an auto accident.

**Doc Wilder: William B. Wilder was one of the authors of two circulars, Circular 14 rev, "Recommended Varieties of Field Crops for Alaska 1953-2954" and Circular 20, "Alaskland Red Clover" (1953).

Weeds, bones, and bees

Hal Livingston

Editor's Note: Hal Livingston went on to graduate from the University of Alaska Fairbanks with a bachelor of science degree in geology in 1956. He completed graduate coursework at the University of Michigan and University of Alaska Fairbanks. Livingston worked as an engineering geologist for the Alaska Department of Transportation and Public Facilities from 1962 to 1996, when he retired as the regional geologist for interior and northern Alaska. He and his wife Nela operate the Alaska Honey Farm in Fairbanks, producing honey, pollen, and beeswax candles.

The first job I had in Fairbanks, in 1951, was at the agricultural experiment farm as a weeder. I and the others worked in the seriously weedy experimental plots removing weeds from the rows of planted seeds. It was pretty tough trying to tell the tiny wanted plants from the tall, more vigorous weeds, especially because the weeds always grew more rapidly than the introduced plants.

In a row fifteen feet long, it often took half a day to clear a swath six inches wide to delineate good from bad. And then, because the desired plants were no longer protected by the shading weeds, they were subject to sun scald. Working in the June sunshine for eight hours, with a short thirty-minute break at noon, was a boring job, but it was work with the promise of a payday at some point, and that meant money to buy meals and pay for an army cot and a blanket at the 4th Avenue Hotel in downtown Fairbanks.

Meals were at Pat and Mike's Cafe, either No. 1 or No. 2. One was on Cushman next door to the drugstore; the other was on First Avenue west of Cushman Street. The food was not fancy, but generous and within my price range. I ate at the Model Cafe on Second Avenue once, but their prices cut into my budget too fast.

Dr. Brinsmade at the farm was an understanding man and would shift our work from weeding to other jobs when he could see our frustration building up. I worked with a family of newly arrived Wisconsin people—the Beckers. Harry, the father, was working at another job, but his wife Helen, daughter Barbara, and son Rick were all pulling weeds. Another son, Donald, came up later, missing the opportunity to pull weeds.

We worked a couple of weeks at the weed pulling and it was a powerful incentive to find other work, which we all did about the time that the experimental plots were weed free. The Beckers homesteaded on what is known now as Becker Ridge, and I helped them survey their land before they built their house there.

I was going to enroll at the University of Alaska in the fall, so went to look the school over. Later I worked at the college, as it was known, painting whatever needed painting. After enrolling as a geology student, I worked for Otto Geist cleaning silt off Pleistocene bones from the gold mining camps.

The next summer I worked collecting the bones of bison, horses, mammoths, musk oxen, bears, lions, sheep, caribou, elk, beaver, wolves, ground squirrels, and camels. All the mining camps around Fairbanks were in full production and thousands of bones were being washed out of the thick layers of perennially frozen silt overlying the gold-bearing gravel. The dredges were digging the gravel and removing the gold, and stacking the gravel tailings in orderly piles all across the valley floor. Dredges were working at Gold Hill near Ester, Fox, Dome Creek near Olnes, Big Eldorado, and Fairbanks Creek past Cleary summit. Engineer Creek on the way to Fox was being sluiced too. Millions of cubic yards of silt were washed off the gravel and down Goldstream, Cripple, Dome, and Fairbanks Creek into the Chatanika, Chena, and Tanana rivers. Today little if any effect of all this silt can be seen on these rivers.

In the winter the bones were cleaned, cataloged, shellacked, numbered, and sorted. The best were packed in wooden boxes that Otto scrounged from the businesses downtown. They were filled, nailed shut, and addressed to the American Museum of Natural History in New York City. Three tons went out in 1952.

In 1961 Harold Downing gave me a beehive, and I ordered a three-pound package of bees. Hastily reading up on the few books at the Thomas Library on First Avenue and at the University of Alaska, I started beekeeping. The first package of honeybees was hived using a paper bag with a cellophane window over my head and cloth gloves covering my hands. The honeybees and I have been going steady since, and there are now colonies in Hawaii also. Over forty-five years the bees have produced more than 62,000 lbs of Alaska honey and those in Hawaii, 24,500 lbs over seventeen years.

My four sons were raised on home-grown vegetables from the garden they helped cultivate, weed, and harvest. Our diet was supplemented with moose meat, caribou, salmon, and the occasional sheep, bear, and razor clams.

—January 2006, Fairbanks, Alaska

Down on the farm

the first and last days of a summer job

Barbara E. Greene

Note: Pursuing a second career, Barbara E. Greene received her master's degree in Natural Resources Management from the University of Alaska in 1989. Arriving for her new student role, she worked during the summer of 1986 at the Fairbanks Experiment Farm, where she served as tour guide, began development of the visitor center, and performed many other "duties as assigned." Retired now (photo at right), she hikes the woods of north Florida, volunteers at the visitor information kiosk at the Tallahassee Regional Airport and at the Welcome Center in rural Wakulla County, where she lives. Greene generously responded to our request for reminiscences about the farm with these engaging accounts.

Day 1

I watch the houses and trees glide past the window as the Blue Line bus makes its way up University Avenue toward campus. My mind barely takes in the familiar scenery because it is so busy with thoughts of the pancakes and bacon I'll be eating almost any minute now. I'm going to order a tall stack, a farmer's breakfast. Saying goodbye and thank you to the bus driver, as we do in Fairbanks, I head for Wood Center's front door. Except the door won't open. Peeking through the glass, I see only gloomy emptiness. Come to think of it, I don't even smell bacon. You can always smell bacon cooking at this time of day, just as soon as you get off the bus.

In the excitement of going to Oregon right after spring semester classes ended, I hadn't thought to check the Wood Center vacation schedule. There'll be no pancake breakfast this morning, and no using Wood Center's bathroom either, before starting the mile and a half trek that remains of this journey—the journey that will lead to one more Significant Emotional Event in my fifty-one-year-old, born-again student's life: The First Day of My First Job in Alaska—at the University of Alaska Fairbanks Experiment Farm.

For lack of a better plan, I start walking. About a quarter of the way to the hilltop looms an opportunity: the high rise dormitory complex, the Campus Hilton, as students call it. Even when classes aren't in session, these dorm rooms house conference attendees. This place could be open today. If it is, I bet there'll be a vending machine inside. I don't suppose it will dispense pancakes and bacon, but by now, just about any food, as long as it isn't liver, will be a treat.

I walk right in the front door and stand in a deserted lobby, wishing someone were at that information desk so I could explain my plight and not feel like the prowler that I guess I am. But in my prowling, I find it. Just outside the TV room stands a vending machine. And down the hall, opposite the TV room, I spot two doors. After tiptoeing to the room marked "Women," and back to the vending machine, I purchase an ice cream bar and quietly exit the building.

Continuing up the hill, I take off my jacket. Even at 7:30 in the morning, it has become too warm for that little windbreaker. How different from last week, when I left Fairbanks with patches of snow in the shade, the Tanana River still frozen, and Fairbanksans happy to awaken to a 40º morning.

At the top of the West Ridge, I leave the pavement and start down the dirt track, the back road to the farm. I look from the spruce- and birch-covered hillside on my right to the squared-off sections of slate-colored loess that decorate the flatlands below the hill to my left: bare soil, just planted with barley and hay.

The fragrance of spruce needles gives way to the scent of livestock. The old white farmhouse, the red barns, and the pens and lots filled with pigs and cows come into view, completing the picture that I have longed to be a part of for the past year and now am about to step into. I hope these goosebumps and the lump in my throat go away before I meet up with any coworkers. Farm hands are supposed to be tough and gritty, not the dreamy romantic that I become whenever I get near a farm.

One good thing about missing breakfast is that I arrive at the farm well ahead of starting time. I find Joe, my supervisor, in the shop sipping wonderfully fragrant, freshly brewed coffee. He offers me a cup. Joe Holty is 5'8" at the most, but muscular and agile—tough, some say, yet those smiling, gray-blue eyes suggest a gentleness that I think I am going to appreciate.

"First one here puts on the coffee," he tells me. Maybe I won't need Wood Center.

"Since you are the tour guide, touring visitors is priority number one," Joe emphasizes, as we finish our coffee and walk out of the shop to begin my indoctrination. "During slack times, if Pat and Grant need help in the garden, it's okay to help them."

We enter a faded, beige, modular building that sits across from the shop and next to what will become the demonstration garden. Joe tells me that one of my job assignments is to convert the small central area of this building into a visitor center—a place that will contain information and displays to tell visitors about the farm.

"This building houses offices and labs for some of the ag and forestry researchers," Joe explains, "but during the summer these researchers are out in the field most of the time. No one uses this central area except to walk through it to get to the offices or labs. By law we're supposed to provide restrooms for visitors. The two small bathrooms in this building are what we've been offering." He points down a gloomy hallway, along which I see two doors, labeled by gender. "It doesn't say much for the farm or the university to have tourists walking through a place like this to get to those restrooms."

I couldn't agree more, as I look around at these dingy, dirty quarters. Then I learn that my duties also will include keeping this area—including the two bathrooms—clean. Well, cleaning is one thing I already know how to do, thanks to my German-Norwegian mother. "The people who work in the fields and in the shop have some time on their hands right now," Joe goes on, "time that they won't have once the crops get growing. So if you would like to have some things built for those displays you design, help is available. But you have to hurry and tell us what to build."

This job gets better (not to mention busier) by the minute. I can hardly wait to get started on all of this creative part. But first, I have to learn my way around the farm so I won't get me and the tourists lost as I try to guide us through the barnyard.

We step back outside and Joe walks me around the grounds, pointing out specifics that the tour guide should point out to tourists. I try to jot down notes as fast as he talks, but it is not easy to do. It's hard to imagine, on this quiet, spring morning, that there will be a time when passengers from six Greyline and Princess tour buses, a group of children, and a few dozen independent tourists will be milling around the place at once, as Joe promises me will happen.

"And that will be an ordinary day, not a busy day, so we need some self-guide information along with those interpretive displays we talked about," he said. "One tour guide cannot personally tour all of those people at the same time. And besides, since we will be in constant daylight for the next two months, people will wander around this farm at any hour of the day or night. I have seen them here at two and three in the morning."

After we complete a circle of the grounds and return to the modular building. Joe leads me to another room, down the hall past the restrooms, a room with a desk and a telephone. "We haven't had an office for the tour guide before, but this office became available, and I think you could use one with all the work you will have to do on the visitor center."

When I thank Joe for the office, he answers, "As I said, you'll need it," leaving me to deal with the scribbles on my note pad and the piles of papers and other miscellanea that cover this desk that has just become mine.

I check my watch. Only 10:00? Well, I need all the time I can get to prepare for that first tour, whenever it may be. Joe seemed to think I wouldn't see any visitors for at least a week, maybe even two weeks. The phone on the desk, my desk, rings; my first phone call. Larry, calling from the shop, tells me that he just booked a school tour for 10:00 tomorrow morning. "The woman who called couldn't wait for you to get to a phone, so I took care of it."

"Thanks," I gulp. So much for that week or two to prepare. I had better get walking around this farm right now. I pause in the central area to assess the potential for converting this grody room into an attractive visitor center. I wonder if I really am as creative as I like to think I am. I start out the door and practically bump head on into Pat, one of the horticulturists from the garden area. "We need your help in the garden now," she informs me, making it clear that there is no room for negotiation. "Follow me."

Pat stands only an inch or so taller than my five foot five inches, but her slim, well-proportioned physique reveals mostly muscle and strength. In spite of the walking and book toting I do, I look puny and flabby next to her. I hope this summer at the farm will make me look as fit as she does.

We walk into the garden area and there stands Scott, a young student, a classmate, one of the buddies I drink coffee with sometimes at Wood Center. He tells me he will be working all summer in the garden. Talk about something making your day. How good it is, on this morning of strangers and uncertainties, to find an old friend about to work beside you.

Pat begins to explain our assignment, but here comes Grant running up to us, calling, "The train! The train!"

She laughs and points toward the tracks across the road on which the Alaska Railroad's morning passenger train is approaching, on its way to Denali Park and Anchorage. "Grant likes to wave to the tourists on the train, so we all do it."

"It's good PR," Grant says, "Those tourists will leave Fairbanks thinking that we are all real friendly people. You watch and see how many wave back."

I'm with Grant. I love trains and I especially love that Alaska Railroad train. I wave and smile and wave some more and see plenty of hands waving back at us from the train's windows.

Scott and I reluctantly give Pat our attention once again as the last blue and gold ARR car passes the farm. She leads us to a circular patch of impeccably tilled and graded soil and hands Scott a wooden post as tall as his six-foot body height and so thick that his big hands barely encircle it. She hands me a junior version of Scott's post. Scott walks to the center of the circular patch and plunges the post's pointed end into the soil. One end of a heavy cord is attached to this post, the other end, attached to my post. "Now, walk away from Scott," Pat instructs, "until the cord becomes taut. Okay, now keep the cord taut and the point of the pole touching the ground and walk."

Like the point of a pencil in a compass, the pole I drag draws a perfect circle in the soil. After carving the first circle, I walk toward Scott while he takes up slack in the line until I reach the desired distance from the first circle to construct a second circle inside the first. We continue drawing smaller and smaller concentric circles until all that remains is a space in the center about eight feet in diameter.

I stand at the edge of this circle of circles; goosebumps break out all over me as I realize what Scott and I have just done. We have marked, for planting flowers and making walkways, the showplace of the farm: the demonstration garden's huge central flowerbed. The bed that will contain the splashy, brilliantly-colored annual flowers, and where, at the garden's entrance, surrounded by bright red cannas and giant flowering cabbage and kale, will stand that official sign that identifies this whole garden area with its horticultural varieties from all over the nation and the world. I remember this flowerbed from last summer when I came here from Oregon to attend the Workshop on Alaska. And now, Scott and I have just marked its beginning for this summer. I can't stop smiling. Scott tries to remain as complacent as Pat, but his beaming face can't hide that he is as proud as I.

By now it is well into the afternoon. Everyone, even Scott, is walking off, each in his and her own direction. I try to ask if we are finished, if I will be needed more today. They are, by now, out of earshot and almost out of sight. Why didn't I pack a lunch? I suppose because my larder was bare, and after arriving home yesterday on that all-night flight from Seattle, I couldn't work up much enthusiasm for making a trip to Safeway. But right now, I could go for just about anything to fill the hole in my stomach. That ice cream bar is long gone.

I can try Wood Center again, but I'm guessing that it will be closed all day and maybe longer. But, sometimes during breaks it just runs on shorter hours. I decide to give it another try. If I have to, I'll go back to that vending machine in the dorm. Except that I am out of change. I stop in the shop on my way up the hill to tell someone where I am going.

"Oh, just in time," says Terry the herdsman, handing me a receiver as I walk through the shop door. "You can book this tour yourself."

Grabbing a pencil with almost no point from the desk, and a paper towel from a pile on a workbench, I scribble down the name and the time we decide on for the tour. Tomorrow at 3:00. Oh, boy. Already two tours scheduled for tomorrow and I still can't walk myself around the place without getting lost.

Terry doesn't know if Wood Center will be open either, but he offers me change for a couple of bills and tells me there will be a fresh pot of coffee ready when I get back. It will be break time by then.

Sure enough, Wood Center is closed. Closed all week, according to a sign now taped to the main door. I go back to the vending machine at the dorm and have just enough change for chips and a Snickers bar. As I turn to leave I glimpse a closed door where the hallway that had led me to the restroom was this morning. On it, hand printed with black felt tip marker, hangs a sign that shouts: "THIS AREA FOR RESIDENTS ONLY. NON-RESIDENTS, STAY OUT." Clutching my snacks, I hurry out of the dorm and resolve to pack a breakfast and not to drink a drop of coffee tomorrow morning until I have made the walk to the farm.

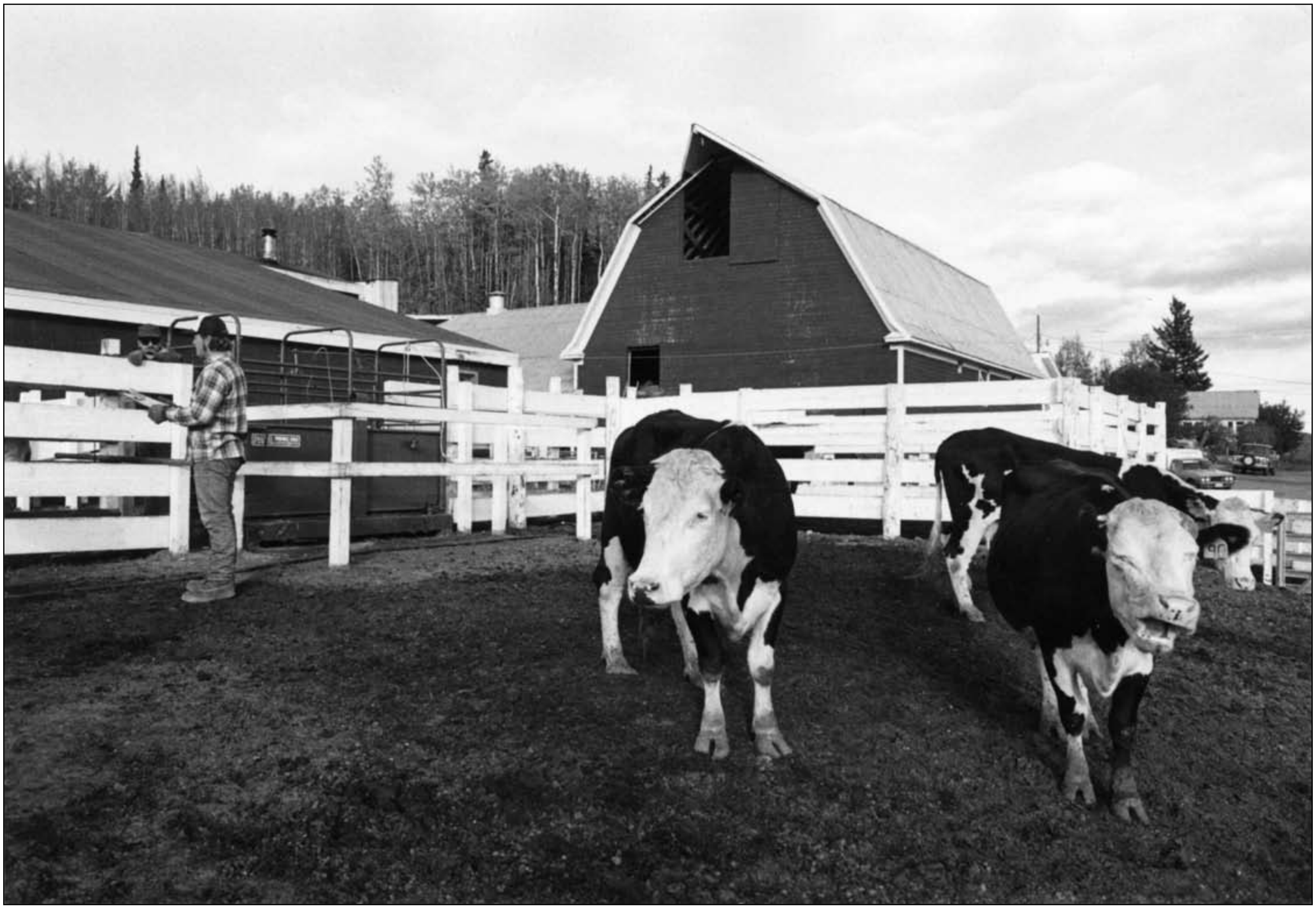
Back at the shop, after I have gobbled down the Snickers and chips and realize that my lunch hour is over, Joe tells me to relax. "Drink your coffee, catch your breath," he says. "I put some books about Alaska agriculture on your desk."

"Thanks," I respond, grateful for anything that will get this learning process started. I plan to learn a lot, but right now, I need to know something by tomorrow. The more I look, the less I know, I discover, now on my third loop around the barnyard. Each time I come up with a spiel, I find a hole in my information and try another tack. It begins to boil down to "Those are cows. Those are pigs." Well, at least I won't get lost leading the children around tomorrow. After three loops, I know the route.

When I return to my office a little after 5:00, ready to grab a few books and go home, I realize that I haven't cleaned the bathrooms. I run to the shop, but the shop is closed. I can't get soap or bucket or mop, so I clean the sinks and toilet seats with hand soap from the dispensers and paper towels, which, happily, seem to be in good supply. It makes a monumental improvement.

It is almost 7:00. I take off on a run and make it to Wood Center just before the last bus of the day pulls away, get off at the University Safeway and buy food for a week's worth of brown bag breakfasts and lunches, plus a can of coffee for the shop. At ten o'clock I finally sit down to read from the stack of publications Joe gave me. But how did that radio get turned on? I half listen to the unrecognizable songs, too tired even to care why the radio is playing. "Good morning. It's 5:00," a DJ chirps. What happened to the night? The book lies sprawled across my chest. If I read anything from it, I don't remember.

Oh, please don't let any children on those tours today be farmers' kids.



—AFES FILE PHOTO

A Last Hurrah

"I have been dreading the morning I drive up to this," says the Westours driver as I step onto the first bus of the day. Fairbanks has just had its first frost. Summer is over. This job is almost over.

Last month you couldn't have convinced me that this time would ever come. Tourist season had reached a crescendo. The numbers of farm visitors exceeded even those Joe had predicted in his most exaggerated warnings. At least six to eight tour company buses lined up at the garden's edge by 10:00 each morning. Most afternoons ten to twelve buses rolled in. Recreational vehicles, cars, and pickups of all sizes and shapes jammed the parking lot, many of them coated with mud from the Alaska Highway, the haul road to the Prudhoe Bay oil fields, or any of the other roads to adventure, paved or not, that one can drive in Alaska, if one knows where to find them.

Children's groups came daily—sometimes two and three times daily. They came from day care centers, vacation bible schools, girl scouts, boy scouts, Campfire, or just a bunch of moms taking the neighborhood kids on an outing. On Fridays I led special tours as a part of the campus walking tour program. Some Fridays so many participants came that I divided them into two or three smaller groups so all of us could hear each other better and the visitors would feel freer to ask questions as we walked that familiar loop. That familiar loop. Remember, on my first day of this job, when I worried about getting lost leading people around that loop? I wonder how many times I have walked it by now.

Any breaks I got during those hectic days were spent keeping up the rest rooms. And they always needed it—especially after the children's groups had been here. In addition to the usual towels on the floor, toilets not flushed, etc., one never knew what those kids might do. One day when it was 85°F outside, I found the radiators turned on full force in the men's room. Major cleaning and scrubbing of both the central area and the rest rooms I did after 5:00 and on weekends.

Now, things have slowed. As in early summer, there is time again to talk to almost all of the visitors. The bus drivers and I have become buds again, talking and joking with each other about our jobs, our lives. During that midsummer frenzy, when all of us were trying to juggle the hours in the day with the masses of people to be served, we sometimes got testy with each other. We were tired.

Now the restrooms are clean.

And the garden is dead.

"Good morning," my voice projects from the microphone the driver has handed me. "Sometime early this morning, August 26, the temperature dropped to 28ºF. Today, you are witness to the beginning of the end of Fairbanks' summer. Not every tourist gets to claim that."

"Take a walk through the garden and see what did survive. Amidst the wilted, drooping flowers and vegetables you will find some strong, healthy ones. There is a crew out there now clearing away dead plants, so the cold-hardy ones, such as pansies and cabbages, will be easier to see. And if you walk past the annual flower and vegetable gardens to the perennials, you will find flowers there that are sturdy and blooming too.

As the day wears on I refine my spiel about the frost and direct attention also to the beautiful "amber waves of grain" in the agronomy fields, where the barley has almost ripened. Some of the drivers tell me goodbye for the summer. We talk about places they might go instead. I remind them of the tour through the animal areas that many of the drivers forgot about once the garden came into full bloom and tell them of the new displays we have added there. Some say they will think about it; others say they probably won't.

You couldn't have convinced me a month ago that I would ever miss those tour buses. But that empty feeling already has made its way to my chest.

One sunny afternoon, one of the buses reappears. Seems it is such a beautiful day the driver thinks his passengers ought to be out in it rather than sitting on a bus or visiting indoor places. The animal tour will be fine.

"Well, folks," my voice comes out over the bus's microphone, "today you are going to get an X-rated tour. Mark, our resident Hereford bull, has been released into the pasture to do his job."

"That's great! I'm a sex psychologist," a woman in the back of the bus calls out.

Mark puts on a show for all of us. The psychologist snaps picture after picture from every imaginable angle. We have a lot of laughs over her antics, and that gets every one in a good mood and we enjoy the whole loop around the barnyard. As we head back to the buses, I tell them what they still can see in the garden area and point out the agronomy fields, filled now with cranes and geese, while the snowy Alaska Range sharply defines the horizon against today's autumn-clear sky. Driver and most passengers decide that they would like to linger a little longer and set out for a stroll to the far end of the garden, where the larch trees are now turning golden. I point out the picnic tables under the huge, green- and gold-leafed, birch trees to those who hang back, not up to any more walking; just the thing and just enough room for that small group to sit down for a while.

I stay with those at the picnic tables to try to make this time good for them too, since some would rather not have stayed this extra time at the farm. I point out the masses of fireweed just visible at the far end of the agronomy fields. "If your bus trip should happen to take you to that end of Geist Road, be sure to have your cameras ready. Fireweed is at its peak now—buds opened all the way to the tip of the stem—and the view of the fireweed, from that road, with our farm's barley and hay fields and red barns in the background is one of the most spectacular in town at this time of the year.

"I'll bet our driver will go that way if we ask him," a passenger whose name badge reads MIKE says.

"My husband is an avid photographer," adds a passenger named Mary. "That's why he had to walk down to those larch trees you told us about. I'm sure he will want to go that way if he thinks there is another picture in it."

"Honey, help us convince our driver to take us to that road that runs past the field on the other side—over there," Mary points, as she greets her returning husband.

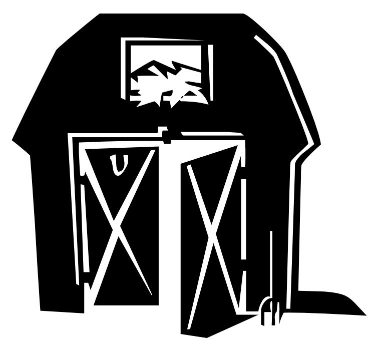
"Oh, I planned to do that anyway," says the driver with a big smile, joining us at the picnic table, right behind Mary's husband. "It's a pretty view all right, and worth taking a side run for."

These happy tourists tell me again how beautiful the farm is and how glad they are that they stopped here.

"Don't forget to look up to the sky tonight," I tell them as they wave to me from the bus windows. "Now that it has started to get dark at night, and especially if the sky stays as clear as it is this afternoon, there is a good chance that you will see an aurora."

The driver thanks me and tells me how glad he is that he stopped here today.

Did I say I was getting tired of this job? How could I ever have thought that?



Reindeer meat—is it always tender, tasty, and healthy?

Eva Wiklund

Note: This article is based on a lecture presented at the 14th Nordic Conference on Reindeer Research, in March 2006 in Helsinki, Finland. The article is published in that meeting's conference proceedings in Swedish, its original language. It is an overview of reindeer meat research in four areas: pre-slaughter handling in relation to animal welfare and meat quality, effects of commercial grain-based feed mixtures and pasture on meat quality, chemical composition of meat and product quality, and sensory evaluation of reindeer meat.

Figure 1. Stress before slaughter can result in elevated meat pH values, which reduce shelf life. Cortisol, ASAT, and urea are examples of blood metabolites that increase in response to stress. Lesions in the reindeer abomasum (gastric ulcers) can also develop rapidly during acute stress.
—Photo: E. Wiklund

Consumer opinion is increasingly important to meat industries worldwide, and consumers most value flavor, tenderness, and nutrient content when evaluating the eating quality of meat. Although the quality preferences of different consumer groups may vary, producing consistent quality is crucial: the quality of every purchase should be the same.

Production systems like reindeer husbandry, where the animals graze during most of the year, are usually considered more animal-friendly and ethical compared with the standard commercial production methods for beef, pork, or chicken. Reindeer meat is a high-quality product that is also attractive to the health-conscious consumer for its low fat content, favorable fat composition, and high mineral content.

Pre-slaughter handling, stress, and meat quality

Reindeer handling before slaughter includes various methods: gathering and herding using such aids as snow machines, helicopters, motor bikes; selecting animals for slaughter using a lasso or by hand in a system of corrals; road transport of animals on trucks; and holding in corrals outside the slaughter plant. Some of these handling routines have been discussed by veterinarian authorities from the perspective of stress and animal welfare.

The first published articles dealing with the effects of pre-slaughter handling on reindeer meat quality were two Norweigian studies (Skjenneberg et al, 1974; Hanssen et al., 1984). As a result of new directives for reindeer slaughter in Sweden (National Food Administration, 1998) an extensive project was started in 1991 to evaluate several handling routines for their effects on meat quality. This project was summarized in a PhD thesis (Wiklund, 1996). Studies of reindeer handling and meat quality have also been performed in Finland.

Because the pH value of meat gives useful information about shelf life, tenderness, color, and water-holding properties, it is a good indicator of meat quality. All the mentioned quality attributes are important for both fresh meat and for meat used as a raw material for further processing. A pH value of 5.5–5.7 is within the normal range, while values over 5.8 result in a reduced shelf life, especially for vacuum-packaged meat.

From the Swedish project it was concluded that reindeer shoulder meat often had very high pH values (Wiklund et al., 1995), something already known to reduce the quality of processed products (Niinivaara and Petäjä, 1985). Road transport of reindeer by truck and herding animals by helicopter did not affect the meat pH values negatively; however, the use of a lasso when selecting slaughter animals seemed to be very stressful for the reindeer (Wiklund et al., 1996a; 1996b). At an early stage of the lasso selection procedure (reindeer slaughtered after thirty minutes), increased meat pH values were recorded, and when the selection had continued for six hours, more muscle energy had been consumed and even higher pH values were measured (Wiklund et al., 1997a). One of the major conclusions from the Swedish project was that, of the

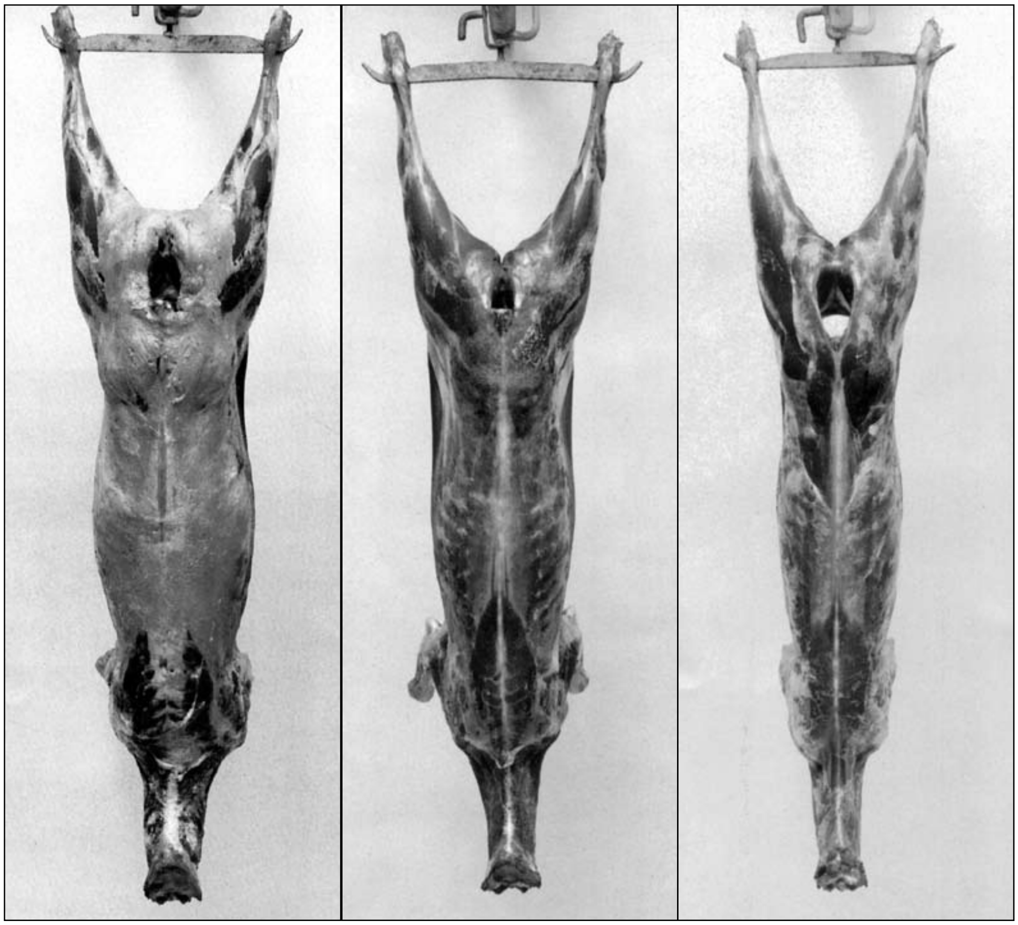


Figure 2. On the EUROP scale (E = best, P = poorest), grading scores for reindeer carcasses normally vary between R and P. From left to right in the figure, carcasses in the groups R, O, and P are shown.
—Photo: Swedish Board of Agriculture

handling routines investigated, lasso selection clearly had the most negative effect on reindeer meat quality.

In the early 1980s, some published studies focused on pre-slaughter handling and stress (Rehbinder et al., 1982; Essén-Gustavsson and Rehbinder, 1984). This research showed that all handling causes elevated levels of stress metabolites in reindeer blood. The same metabolites were therefore measured in the Swedish project in the 1990s, where it was concluded that the lasso selection procedure resulted in the highest levels of all these metabolites (Wiklund et al., 1996). The studies from the 1980s tried to correlate the increased values of the stress metabolites in the blood to chemical changes in the muscles that could explain a phenomenon called 'stress-flavor' in the meat. No such correlation was found (Rogstadkjærnet and Hanssen, 1985; Hanssen and Skei, 1990).

Today, modern handling methods (truck transport and herding with helicopter) are used as frequently as the more traditional lasso selection. The reindeer have become more familiar with these new techniques and today are not at all affected in the same way as they were when these handling methods were introduced about twenty-five years ago. In contrast, the use of a lasso seems to be a routine that is so unpleasant for the animals they never get used to this technique.

Feeding, grazing, and body condition

Meat pH values are directly correlated to the levels of muscle energy (glycogen) at slaughter. If the glycogen stores in the muscles are low, meat pH values will be elevated, which results in the meat quality problems previously described. Low muscle glycogen stores might result from poor physical condition, stress, or intense physical activity. It has been demonstrated that reindeer in good physical condition produce meat with optimal pH values, whether they were fed a commercial feed mixture or grazed (Wiklund *et al.*, 1996a).

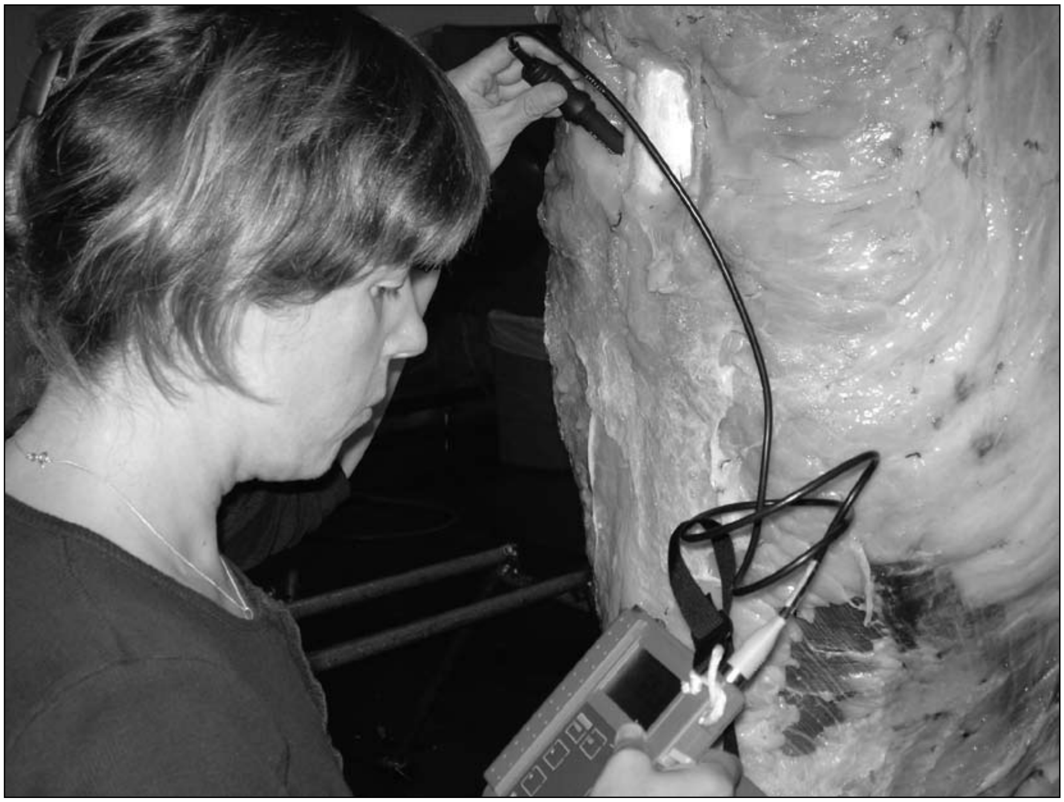
Finnish results (Petäjä, 1983) showed that almost all reindeer carcasses from animals slaughtered late in the season (midwinter or early spring) had extremely high pH values (pH>6.2). The researcher suggested that this was related to poor grazing conditions, which significantly reduced animal body condition.

Body condition can be determined on either living animals or on the carcasses following slaughter. For living animals, weight, body measurements (length, circumference), and various body condition scoring systems that estimate body fat and muscle content are often used. At slaughter, carcass weight, grading scores, and measurement of fat deposits in the carcass can provide body condition information.

Swedish reindeer carcasses are graded according to the EUROP system: the fat and lean content of the carcass are estimated visually by specially trained staff at the slaughter plant (Swedish Board of Agriculture, 2004). On the EUROP scale, E stands for the best body conformation and P for the poorest. A normal variation in grading scores for reindeer carcasses is typically between the groups R and P on the scale (see Fig. 2).

Chemical composition of meat and product quality

As already mentioned, feeding reindeer commercial feed mixtures or letting them graze on good pastures will positively affect the animals' body condition and meat pH



Eva Wiklund measuring pH and temperature (directly following slaughter) in the striploin of the carcass. Meat pH is important for quality attributes like shelf-life and tenderness. The first 24 hours after slaughter, pH declines from about7.0 to 5.5. The interaction between pH and temperature during this time is critical, the carcass has to be chilled at an optimal rate to produce the best meat quality.
—photo courtesy Reindeer Research Program

Below: To get a complete evaluation of meat quality, many different attributes are measured. Here samples are collected for analysis of chemical, technological, and sensory quality, attributes of the meat."
—photo courtesy Reindeer Research Program

values. What the reindeer eat will also affect the meat's chemical composition. Grazing reindeer produce meat higher in polyunsaturated fatty acids ('good' fats) while meat from animals fed grain-based feed mixtures have been found to have higher levels of saturated fatty acids (Wiklund et al., 2001). Reindeer meat has a low fat content, but the fat composition is still important for meat shelf life and for the quality of processed meat products. As a continuation of the Swedish reindeer study in the 1990s, a project started in 2001 focused on the chemical composition of reindeer meat. This project was concluded in a PhD thesis in 2005 (Sampels, 2005).

During storage, meat fats will get rancid (oxidation) and be broken down (lipolysis). Although some of the components formed during oxidation and lipolysis are important for the typical character of different meat products, too much of these components will deteriorate the quality. Two common methods of processing reindeer meat are smoking and drying. New research results demonstrated that the drying process speeds up oxidation and lipolysis in the meat, while smoking seemed to be a much more gentle process (Sampels et al., 2004).

Compared with saturated fats, polyunsaturated fats will oxidize more easily, which increases the importance of the difference in fat composition between grazing reindeer and animals fed grain-based feeds. This information can be used by slaughter and meat processing facilities to sort their raw material in the best way for optimal processing.

In a recent Swedish study, a trial feed was manufactured with exactly the same nutrient content as the standard feed made by the same company. In the trail feed, linseed cake was substituted for the fat source in the standard feed (Renfor Bas, Lantmännen, Sweden). Linseed contains high levels of the fatty acid 18:3 omega-3. Compared with meat from the control group of animals eating the standard feed, meat from reindeer fed the linseed feed had a fat composition much more similar to that of grazing reindeer (Sampels et al., 2006).

In Alaska, a reindeer feed mixture made from locally produced ingredients has been developed by the SNRAS Reindeer Research Program. In this feed mixture, fishmeal replaces soybean meal as a protein source. In a feeding experiment, the quality attributes of meat from three groups of reindeer were compared: animals grazed on Seward Peninsula, animals fed the mixture with fishmeal and animals fed a mixture with soybean meal. When meat from the fishmeal and soybean meal groups was compared, only a slight difference in fat composition was found. Meat from grazing reindeer had significantly higher levels of polyunsaturated fatty acids than the other two groups. (Bechtel et al., 2006).

Sensory evaluation of reindeer meat

Sensory evaluation of food products has become an increasingly important research field over the last twenty-five years. In early meat taste tests, randomly selected people (e.g. all members in a research group) answered questions about meat tenderness or color without any prior training or the use of scientifically developed questionnaires. Trained panel members can measure different quality attributes (tenderness, flavor, etc.) on a scale from, for example, zero to ten, while disregarding personal preferences for the products.

In the 1990s in Sweden, no professionally trained taste panel had experience in evaluating reindeer or other game meats. Therefore, a collaboration with the Norwegian Food Research Institute was initiated. With the institute's help, the Department of Domestic Sciences, Uppsala University, Sweden, learned to select and train a taste panel for reindeer sensory work.

Recently, this collaboration resulted in selection and training of a taste panel to evaluate reindeer meat samples at the University of Alaska Fairbanks (UAF) Cooperative Extension Service Research Kitchen. Associate professor Lisbeth Johansson, who is retired from Uppsala University, led the selection and training of taste panel participants. As a complement to the results of a trained panel, it is common to use consumer preference tests where untrained people are asked for their personal preference for a product. In most of the published reindeer studies a combination of these two sensory tests have been used.

In the Swedish studies, using meat samples for which pH values and stress metabolites in the blood had already been analyzed, a trained panel evaluated samples from reindeer exposed to all the various pre-slaughter handling routines. The only meat samples that stood out as different to the taste panel were samples from reindeer fed commercial feed. Further studies were conducted to compare the effects of different reindeer diets on sensory attributes of the meat.

In a comparison of grain-based diets and grazing, meat from reindeer fed grain-based feed mixtures had the most untypical taste. Meat from grazing reindeer was found to have a stronger and more typical reindeer flavor (Wiklund et al., 2003). In a consumer preference test of the same meat, participants identified the same differences between the two types of meat, and fifty percent preferred meat from the grazed animals, while the other half preferred meat from grain-fed reindeer (Wiklund et al., 2003).

Sensory evaluation is an important complement to technological measurements of meat quality. A combination of the information from a trained panel and consumer tests will provide the best information about the product.

—photo courtesy Reindeer Research Program, UAF

The trained panel in the Alaska study found no difference in sensory attributes between meat from grazed reindeer and animals fed either the mixture based on fishmeal or the one based on soybean meal (Finstad et al., 2005). Comments from the consumer test regarding gamey and reindeer flavor were most common on the meat samples from grazed reindeer. For the fishmeal, no negative effect on any sensory attribute was reported (Finstad et al., 2005).

Consumers often mention tenderness as the most important sensory attribute for meat. In the mid 1990s, a research collaboration between the Swedish reindeer project and Utrecht University in The Netherlands was started to study tenderness in reindeer meat. Biochemical measurements of tenderizing enzymes and microscopical studies of the meat tenderizing process were carried out.

Reindeer meat was demonstrated to be much more tender than beef, and aging the meat was not necessary to optimize tenderness; when carcasses were boned one day after slaughter the meat was already tender (Barnier et al., 1999). This phenomenon was explained by high activity of the tenderizing enzymes (Wiklund et al., 1997b) and small muscle fiber size in reindeer meat (Taylor et al., 2000).

Ongoing reindeer meat research

Although research on reindeer meat production and quality has always been very limited, it is of great value to reindeer herders worldwide, who are primarily engaged in meat production. In Alaska and Sweden, research is currently conducted in the following areas:

- Electrical stimulation and pelvic suspension of reindeer carcasses
- Seasonal variation in carcass composition and meat quality in reindeer bulls and steers
- Development of pre-cooked reindeer meat products
- New feed ingredients and their effects on meat quality

For most consumers, it is of great importance that reindeer meat actually be different from beef, pork, and chicken. The image of reindeer meat has been frequently discussed over the last few years, especially in the Nordic countries. In some of these countries, new brand names and labeling have been of particular interest, and various criteria to measure and guarantee the desired quality of reindeer meat have been debated. For marketing, reindeer industries in Nordic countries emphasize such attributes as “natural,” “exotic,” “exclusive,” and “healthy” The introduction of new production methods, handling routines, feeding strategies, and slaughter techniques should be well balanced to fit into the image of reindeer meat as a perfect product for modern consumers concerned about health and the environment.

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The expert tastebud: a sensory panelist's training experience

Deirdre Helfferich

The tools of the sensory panelist: laptop computer for recording scores, tray of samples, paper towel and fork, water cup, spittoon cup. Not pictured: the all-important trained tongue and nose.
—PHOTO COURTESY REINDEER RESEARCH PROGRAM

The taste test

When the Reindeer Research Program (RRP) needed a panel of trained tasters to examine samples of reindeer meat, I volunteered. I'd never participated on a taste panel, and it sounded interesting—and I like venison. First, however, I underwent a test of my tastebuds, along with several other volunteers, to see if I could discern varying strengths of different basic flavors: sweet, acid, metallic, bitter, and umami. (I'd never encountered this latter word before; it is the term for a flavor that could be variously described as smooth, rich, mushroomy, meaty.)

We were asked to taste two trays of thirty-six samples each of colorless liquid in plastic cups. We rated them by strength and flavor, spitting out the flavored liquid and rinsing our mouths with tap water between samples—but by the time I was halfway through the second tray, the ol' tastebuds got tuckered out and everything began to taste nasty, like a sour old sock. The water with which I was rinsing my mouth between samples became the most terrible drinking water it had ever been my misfortune to swirl over my tongue, although it hadn't started out tasting bad. The contorted facial expressions I made seemed to amuse the lab technicians at the Cooperative Extension Service (CES) food-product test kitchen, who patiently emptied and refilled my cups.

By the end of it, I wasn't sure if I could discriminate taste at all, and I wasn't the only one making faces. I was convinced that my tastebuds must be useless for what the RRP was going to need. They rewarded me for my suffering with a package of reindeer sausage—which tasted very good for breakfast the next morning, by the way. I was startled to find out later that I had passed their test.

After this experience, a group of us were selected as sufficiently sensitive that we progressed beyond the initial test to the next stage of forming a sensory panel: determining qualities by which to evaluate reindeer meat for research related to reindeer diets and various handling methods after slaughter.

Determining the aspects of flavor

Dr. Lisbeth Johansson, a Swedish researcher from the University of Uppsala, was here in Alaska for a few weeks to train the sensory panel, working with Eva Wiklund, associate professor of animal science in SNRAS and RRP.

Ten of us arrived for the first session, and Johansson explained that we were the experts who would decide what aspects of reindeer meat were worthy of examination. She, Wiklund, and CES food research technician Kamolluck Trateng would assist us, and she would guide us in working together over the next two weeks to choose those characteristics that best described reindeer meat samples. This, she said, was the first part of training a sensory panel, and we were getting the accelerated course. Training normally takes about six to eight weeks.

We needed first to agree what aspects of the meat were important, and then to determine that the words we chose were describing the same thing. It took several days of brainstorming and tasting to get it down to a few important qualities and terms: tender, juicy, gamey, sweet, bloody, liverish, and intensity of smell. We would later use these to evaluate cuts of meat using a zero to ten scale.

Notice that value judgements such as "good" or "bad" were left out. "Nasty" and "delicious" are subjective terms, and particular to the individual using them. To be able to provide a useful guide, we had to find a way to convey what the taste was, and leave the value judgement to the producer or the eventual consumer of the meat. But even the terms we came up with were subjective: what did we mean by sweet? Was it sweet like a candy, or sweet of a more subtle sort, like a grain or bread? We decided that it was the latter, a "cereal sweetness." And bloody—what was that? We decided that it incorporated saltiness, a richness, a metallic iron taste. Much discussion was held on the exact meaning of gaminess. One of our number could never quite determine what the rest of us were talking about, and how to distinguish it from a liver flavor. Was it sour? A strength of flavor? A muskiness? That unique reindeer flavor? It was something we all seemed to recognize as a distinct flavor, but describing it to each other and coming to agreement on what it was and what terms to use for it was very difficult.

We also had to figure out what we meant as a group by the scale. Obviously zero was none, no trace of a particular flavor or flavoring quality. But what was ten? Tenderness, for

Dr. Lisbeth Johansson, center, training the sensory panel. The panelists have determined the attributes by which reindeer meat should be evaluated (listed on the whiteboard), and are now preparing to calibrate their intensities. George Aguiar of the Reindeer Research Program writes responses from the panel on the board.
—Photo courtesy Reindeer Research Program

example, at a ten was melt-in-your-mouth tenderness, such as the very finest fish has, we decided. A zero on this scale might be likened to old shoe leather. Dr. Johansson marked our scores for our meat on the whiteboard, so that we could see how we scored the same sample. There was a surprising level of agreement on most attributes, particularly on juiciness and tenderness. Some attributes, however, had scores that ranged all over, with discrepancies that would have made for a statistically significant error. So we had to taste more samples and discuss them, working toward common understanding of each attribute's intensity levels. Eventually our deliberations led us to a general agreement for each quality and its scale.

We tasted various meats, and later learned that not only had we been nibbling reindeer, but beef, bison, and moose also. Many of the cuts were delicious, but alas—we couldn't eat them. The procedure was this: a sliver of meat (sometimes two) was presented to us. We were to take it, smell it, fold it in half, take a bite from the folded center, chew ten times only, then push the bolus of food up against our palate and squeeze out the liquid with our tongue, then spit it all out into a handy cup. Before tasting the next piece, we were to rinse our mouths thoroughly with water, and also spit it out. This was to cleanse the palate and keep flavors from previous pieces of meat from interfering with our evaluation of the current piece. But oh, it was hard—a lot of that meat was *good*.

Evaluating the meat

When it came time to put our training to work, we were summoned again to the conference room where we were trained, and received a tray of twelve numbered cups, each with two slices of meat in it. A computer program (one laptop per tester) guided us through each sample, and we recorded our scores for the meat's attributes as we went, adding comments if it seemed necessary. The first piece of meat: open up the container, sniff deeply, sniff again. Not very pungent. Maybe a four. Extract from the cup, fold, bite, chew ten times, squeeze out the juice with the tongue, spit. Hmmm. Really tender. Say a seven. Very juicy. An eight. No detectable gaminess. Zero. Next piece of meat: fold, bite, chew, squeeze, spit. Whoa. That one was actually a bit gamey. Not very sweet, pretty bloody-tasting. Definitely liverish.

And so on. The two pieces in each sample almost always seemed to me to be the same in their attributes. We used the two slices to concentrate on different attributes for the same sample. Sometimes, however, the slices seemed to differ slightly from each other, and when they did, I would note that in the comments. We received two trays each, taking a little break between trays to give our tastebuds a rest and avoid the overloading we'd experienced before in our intensive tastebud test.

Despite the intrinsic element of low humor in the procedure, what with all the spitting and plunking sounds coming from the panelists, it was generally silent, our mouths full and our minds concentrating on what we were tasting and smelling. Dr. Wiklund or a graduate student walked around, taking away the spittoons (plastic cups), refilling our water cups, providing extra paper towels.

The unchewed ends of meat slices piled up, and I hated to see that delicious meat go to waste, so I asked if I might save mine and take them away. The scientists laughed—but they agreed. They had no further use for it, and it would just go in the garbage otherwise.

I had reindeer stroganoff for dinnner that night.

For more on tasting reindeer at the University of Alaska Fairbanks, see Ned Rozell's article, "Reindeer tasting: nice work, if you can get it," Alaska Science Forum, April 19, 2006. It is available on line at http://www.gi.alaska.edu/ScienceForum/ASF17/1799.html.

Controlled environments in Alaska

Doreen Fitzgerald with Meriam Karlsson

Simple to highly advanced controlled environment systems—from temporary cold frames and high tunnels to facilities using technology developed for space exploration and missions to Mars—can be adapted to Alaska's regional conditions to improve production of vegetables, berries, and floral crops. Led by professor of horticulture Meriam Karlsson, ongoing research at the Agricultural and Forestry Experiment Station investigates plant requirements, varieties, and treatments to maximize productivity for growers.

"The value of Alaska's horticulture and landscape industries has increased fivefold since 1976, when the first statistics were collected, Karlsson said. "Today this segment accounts for more than half of the state's agricultural receipts, excluding aquaculture. There's no indication that the market potential for horticultural products has been reached, and the state's Alaska Grown marketing program is creating opportunities for in-state production."

Contollred Environment Agriculture Lab

Karlsson is principal investigator for a multi-year study that has several objectives: develop cultural management techniques and reliable protocols to efficiently produce suitable vegetable, culinary herbs, small fruit, floral, transplant and hanging basket crops in various environments and systems (traditional, seasonal, grow room, cold frame and high-tunnel greenhouse); identify economically viable crops and suggest sustainable private business opportunities in greenhouse controlled environments; develop guidelines and disseminate information suitable for Alaska on how to operate, adapt and maintain functional and cost-effective greenhouse crop production systems.

Various combinations of environmental systems and field production techniques can extend the season and produce high-quality fresh crops that can replace produce imported to Alaska. Moderate temperatures, low relative humidities, and isolation from large established agricultural production areas reduce risk of contamination and outbreak of serious crop diseases and pests.

"This presents opportunities to market fresh products of exceptional keeping quality and a decreased probability for pesticide residues, all of which corroborate efforts to increase commercial greenhouse production," Karlsson said.

The growth of Alaska's horticulture industry has challenged both researchers and educators to keep pace with information and training for efficient management, cultural procedures, and environmentally sustainable practices for local commercial production. The intense management of traditional and nontraditional crops in controlled environment systems requires an understanding of the growth, development, flowering, and fruiting physiology of many plants. An understanding that is more detailed than the often well-documented cultural procedures for field conditions. Much of Karlsson's research relates to supplying this kind of information. She and her associates are investigating several crops that are promising for local greenhouse production and marketing. Tomato culture is currently under study in the new controlled environment agricultural laboratory (CEAL) [see page 27]. "Best suited for regional production are high-value crops of limited keeping quality that degrade during extended transportation or marketing," Karlsson said. "For instance, there are opportunities for growers to produce quality fresh raspberries for local off-season marketing to restaurants, supermarkets, and directly to the consumer. One of Karlsson's research projects involves extending the raspberry season.

Other options are crops of special local interest, value-added, or intended for niche markets, such as the Alaska state flower forget-me-not, cut sunflowers, and culinary herbs. The leafy vegetables butterhead and romaine lettuce, oriental and specialty greens, along with beans, tomatoes, peppers, and strawberries are other examples of potential controlled environment greenhouse crops. Local markets for numerous greenhouse-produced bedding plants, transplants and hanging baskets are already well established and continue to expand. Karlsson said that during recent years, requests for producer information concerning crops projected for ethnic markets and year-round fresh leafy vegetables have increased.

Because today's controlled environment crop systems are technologically advanced, producers seeking commercial viability require knowledge of horticulture, plant physiology, plant pathology, chemistry, engineering, computers, and business skills. For sound business and marketing plans, growers need accurate information on production costs and demand—information that can generate small business ventures, employment, and revenue for rural development and community growth.

"Production management and business information developed specifically for our diverse northern Alaska conditions supports sound greenhouse business decisions, planning, and administration," Karlsson said. "The market demand, potential, and economic feasibility for producing

Tomatoes and lettuce growing in the new controlled environment agriculture lab at the Fairbanks Experiment Farm. Under evaluation are techniques for northern conditions that are required as year-round production becomes feasible using geothermal energy. Since 2004, professor of horticulture Meriam Karlsson and research professional Jeff Werner have been working with management and staff at Chena Hot Springs resort to assist them in developing a complete greenhouse production system, from setup, production, and personnel training to product development, labeling, and marketing.
—PHOTO BY MERIAM KARLSSON

local fresh crops during periods outside the normal field season in Alaska are not well understood or documented, and for most crops, there's a continuous need to establish greenhouse production budgets that take into account the cost of imported produce."

Access to adequate fundamental, focused, and continuing education is necessary to train and maintain a skilled and qualified workforce for successful management and operation of production facilities of variable technological advancement. In the case of completely controlled environments, guidelines for the use and maintenance of smaller sized ones are available, but these units usually are intended for research purposes, so the recommendations are directed to scientists with high demands for precise environmental control and monitoring, not crop management and productivity.

Karlsson's research is aimed at providing growers with comprehensive information for controlled environments. "We're now working to develop recommendations specifically intended for facility operation and production management of protected commercial cultivation in high tunnels, greenhouses and controlled environments at high latitudes," she said.

High-tunnel production throughout the United States has revitalized productivity of many high-value climate sensitive crops. Graduate Student Heidi Rader, working with Karlsson, has just completed her second season of high-tunnel research at the Fairbanks Experiment Farm (story on page 31). At Pennsylvania State University, a high-tunnel research and education facility is evaluating such benefits as frost protection, increased soil and air temperature, rain and wind protection, and improved insect, disease, and predator control for producing various vegetables, small fruit, and ornamental crops.

"The results produced by high-tunnel modifications to the environment are overwhelmingly positive. They improve earliness, crop yield, quality, and disease control," Karlsson said.

Also at the Fairbanks Experiment Farm, Karlsson now has the CEAL facility in which to generate information on specific crops. Unlike a greenhouse, the closed laboratory allows for precise control of lighting, temperature, humidity, and nutrients, so that different varieties and various treatments can be tested.

The building that houses the new lab started its service in the early 1970s as a swine research facility, and swine research continued there until the summer of 2000. The renovated building is 50 x 50 foot square, with about 1,500 sq ft. of growing area. The remainder is used for research support areas—a walk-in cooler to maintain temperatures between 35° to 40°F and space for environmental controllers and monitoring.

Tomatoes are now growing in the CEAL facility for research purposes. Some information developed and gathered here is already in use at the new Chena Hot Springs geothermal production greenhouses (see page 28).

Greenhouse tomato production for Alaska

by Meriam Karlsson

The long history of fresh-market tomato production in greenhouses and controlled environments includes Alaska, where commercial greenhouses were producing tomatoes in the 1920s. Today, research and production advancements have resulted in highly advanced and efficient techniques and systems, and cultivars have been developed specifically to work in these systems. These new tomatoes are all indeterminate, with a continuously growing terminal bud. They can be prompted to produce fruits on a stem several meters long, which makes possible a trellising system that maximizes production in limited space. New research at the Controlled Environment Agriculture Laboratory (CEAL) involves this type, which is the kind of tomato grown in the new geothermal greenhouses at Chena Hot Springs Resort. Determinate or bush-type tomatoes are commonly used for field production, gardening, or short three- to four-cluster greenhouse culture. This type has a main stem ending with a flower cluster, encouraging side branches to develop and produce fruits.

Greenhouse cultivars are specifically selected and developed for greenhouse and controlled environment production, not intended for the home garden. At the CEAL facility we will be working with the cultivars Conchita (cherry), Clarance (cluster), Tricia (cluster) and Trust (beefsteak). At Chena Hot Springs greenhouses, where they are producing tomatoes and other vegetables and herbs for the resort, they are growing the same cultivars plus two grape-type tomatoes, Dasher and Amsterdam.

Grafting

Grafting is now the norm for commercial tomato production in the United States. Tomatoes were originally grafted onto hardier rootstocks to improve disease control. Although a soil-free growing medium is now commonly used for greenhouse tomatoes and soil-borne diseases are no longer a major threat, grafting a cultivar scion onto a vigorous root stock is still beneficial. Higher productivity results from using a root system selected for vigor that is well-developed and stronger than available on roots of cultivars selected for quality, uniformity, taste, and yield.

For our research, plants in the seedling stage are grafted onto a wild tomato strain called Maxifort. The grafted plants are from Bevo Plant Propagator Farm, Milner, British Columbia, Canada. They are transplanted and grown in five-gallon bags filled with a commercial peatlite mixture (Premier Pro-Mix BX, Premier Horticulture, Premier Brands, Red Hill, Pennsylvania) or in Dutch Bato buckets (Bato Plastics, Zevenbergen, The Netherlands) filled with perlite (Supreme Perlite Company, Portland, Oregon). The advantage of these containers is that they drain into a collection pipe with minimal loss of water and nutrients, while keeping the floor dry.

Trellising

In efficient commercial systems, tomato plants are trained to one single stem by removing developing lateral shoots (suckers) in the leaf axils. The stems are supported with twine connected to an overhead wire.[1] As the growing plant reaches the wire, it is lowered, letting the stem lay horizontally while keeping the growing shoot upright into the light. Plant density depends on the production system, time of year, light conditions, and the cultivar vigor. For most greenhouse applications, two to three plants per square meter or four to five square feet of floor space for each plant have been suggested suitable.[2] This system, in use at the CEAL and Chena Hot Springs facilities, is shown at right.

For the laboratory research, each cultivar is grown in a double row system with ten plants per row to allow for evaluation of management, growth, and yield performance. Plant spacing of thirty inches in and between rows and paths of four feet seem to work well for proper maintenance.[3] Plants are trained on the trellis system when they develop six to eight large leaves.

Each plant is lined up to a string attached to an overhead cable stretched about eight feet above the tomato bag or bucket. To develop one strong main stem, all lateral shoots (suckers) are removed as the plant grows. Removing lower leaves as the plant grows improves air circulation and facilitates plant handling. When the plant growth reaches the cable, the plants are lowered four to five feet along with the removal of the oldest three to four leaves.

Greenhouse tomatoes are grown in an artificial medium with water and nutrients cycled through the individual containers. Varieties developed specifically for this type of production can yield up to ten pounds per square foot. Research on production techniques at the controlled environment lab will benefit people who pursue local greenhouse production at geothermal sites and other remote areas.
—PHOTO BY MERIAM KARLSSON

Adequate, correctly managed and designed facilities are fundamental to successful greenhouse and controlled environment production. Shown here are ripe cluster-type tomatoes growing in the geothermal greenhouse at Chena Hot Springs Resort. In 2004, the resort installed a test greenhouse heated by geothermal energy. During midwinter subzero temperatures outside, the greenhouse could maintain an environment 130 degrees warmer. The resort now produces flowers, vegetables and herbs for its restaurant, and plans to expand production of high-value perishable crops.
—PHOTO BY MERIAM KARLSSON

Stems are lowered, leaving two feet between the floor and the lowest part of the plant. Every two weeks, plants are shifted and leaves removed. Double row systems are common, with stems guided around the row ends for continued growth along the opposite side of the double row.

Temperature & Light

The tomato is a warm season crop that thrives under high light conditions. Maximum yield is best supported by greenhouses with good ventilation, horizontal airflow and good temperature management (without restricting light). Tomatoes grow best at temperatures above 60°F. Low temperatures reduce overall growth rate and nutrient uptake, and result in poor pollination and fruit development.[4] Maximum fruit production has been reported at 68°F day and 64°F night; fastest vegetative growth at a constant 77°F.[5] For both good growth and optimal fruit development, 68 to 72°F during the day and 60 to 65°F at night are recommended.[6] Research suggests that diurnal variation, with a lower night than day temperature, can result in larger fruits and overall yields.[7]

Growers do not commonly employ artificial lighting due to cost, so in most regions major greenhouse production coincides with naturally high seasonal light, although during the summer, greenhouses are often shaded for proper temperature control. To counter this, and because year-round production is desired, experiments with supplemental lighting to extend and increase the total light available are underway as far south as Arizona.

Because the CEAL is a closed facility with no natural light, we can run experiments there with various arrangements of high-pressure sodium and metal halide light to find the best combination for tomato production. Although artificial lighting is extending and supplementing the day at Chena Hot Springs, the long season of exceptionally short days and limited light makes crops during this time fully dependent on the provided light. The resort is now using a new low-temperature geothermal generator to generate power for the entire facility.

In the CEAL experiments, the days are sixteen hours, using a mixture of high-pressure sodium and metal halide lamps. The instantaneous and total intensity of daily light is adjusted to specific levels. This allows for a comparison of crop growth independent of the light source.

Water and Nutrients

Because this production method demands efficient uptake of water and nutrients, plants are grown in artificial medium with plant emitters (flexible tubing) delivering water and nutrients to individual plants. At CEAL, water-soluble fertilizer is delivered up to six times each day. Fertilizer rates are 100 parts per million (ppm) nitrogen, 60 ppm phosphorus, 200 ppm potassium and 100 ppm calcium in the irrigation water. At the time the first fruit develops, nitrogen is increased to 150 ppm and calcium to 130 ppm.

Tomatoes have large requirements for nitrogen and potassium. Nitrogen supply is strongly correlated to overall growth, so gradually increasing nitrogen in the fertilizer solution from seedling to production stage is common.[8] Potassium is essential for proper fruit development, while phosphorous supports root development. Yellowing of older leaves identified as a magnesium deficiency is not uncommon in tomatoes, although this does not necessarily reduce yield.

In severe calcium deficiency, the growing tips start to die back, and calcium is known to play a role in the most common physiological tomato disorder, blossom end rot.[9] Dark-colored sunken areas develop at the blossom end of the fruit. Calcium is often sufficient in the growing medium, but the transport to the developing fruits is inadequate (uneven or insufficient). Any stress or fluctuation related to water up-take, fertilizer supply, temperature or light may induce and aggravate blossom end rot. To control the problem, avoid

Professor of horticulture Meriam Karlsson and research professional Jeff Werner have been working with management and staff at Chena Hot Springs Resort to help them develop a complete greenhouse production system—from setup, production, and personnel training to product development, labeling, and marketing. A high-tunnel greenhouse supported fresh produce production during the 2004 growing season, supplying the resort restaurant with fresh tomatoes, cucumbers, green beans, raspberries, leafy greens, and culinary herbs. Now the resort has a fully operational geothermally heated facility (4,440 square feet) and 1200 square foot greenhouse. Resort greenhouse manager Rusty Foreaker (left) is shown here with Werner and Karlsson, in the new greenhouse before plants were introduced.
—PHOTO BY DOREEN FITZGERALD

rapid changes in management techniques and environmental conditions, and ensure adequate water supply and sufficient calcium in the fertilizer.

Important micronutrients for proper tomato development include iron, manganese, copper and boron. Automatic irrigation with individual drip emitters providing water and nutrients several times during the day is best suited for sustaining each plant. High electric conductivity levels may be used in the irrigation water to improve the flavor, if balanced with high potassium to nitrogen ratio.[10]

Pollination

Flowering and pollination are essential for fruit development. Tomatoes are self fertile and self pollination is significant for good fruit set.[11] Battery-operated devices are commonly used to aid pollen release. Flower clusters with open flowers are vibrated at least every other day.[12] Tomato flowers also benefit from insect and cross pollination. Bumblebee hives are available year round from reputable suppliers and are now indispensable in larger tomato operations.[13] To ensure sufficient and complete pollination at the CEAL, pollination with the hand-held tool begins as soon as flowers appear. Harvest can start when five clusters of fruit and flowers are present on the plant.

For our research, clusters of ripe fruit are harvested three times a week, and fruits are counted and weighed. In commercial operations, transport and marketing requirements usually dictate at what stage tomatoes are picked. Cluster tomatoes are harvested when the four to six tomatoes in the truss all have reached the desired ripeness.[14] Uniform fruit development and maturation characterize cultivars selected as cluster-ripening tomatoes. The beefsteak-type are picked individually as they ripen, leaving the calyx intact to distinguish them from field grown tomatoes during marketing.[15] Using modern production techniques, yields of ten pounds per square foot are not unusual for greenhouse produced tomatoes.[16]

Recent Projects

During our current research, we expect plant growth and tomato production to continue for nine to ten months. During this time, management and operational procedures are evaluated to establish effective practical techniques for producing tomatoes in controlled environments and greenhouses. Based on growth, productivity, and yield records, the most effective light spectrum at a specific light integral will be determined, along with management procedures for the most effective tomato production.

Footnotes

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9. Barkley, 2004; Papadopoulos, 1991; Ross, 2002; Snyder, 2001.

10. Papadopoulos, A.P. 1991.

11. Barkley, 2004; Ross, 2002.

12. Papadopoulos, A.P. 1991.

13. Anderson, 2002; Barkley, 2004; Snyder, 2001

14. Barkley, S. 2004.

15. Ross, 2002; Papadopoulos, 1991.

16. Barkley, 2004.

Small farm viability

Doreen Fitzgerald, Heidi Rader, and Meriam Karlsson

"When we refine what we do, and as we get smaller, we actually make more money," said Alex Hitt during a recent interview on National Public Radio.[1] "So smaller didn't necessarily mean we were forgoing income, it just meant we got better." Hitt and his wife Betsy, owners of Peregrine Farm in Graham, North Carolina, were regional winners of one of the 2006 Patrick Madden Awards for Sustainable Agriculture. The award is from the Sustainable Agriculture Research and Education (SARE) program, part of USDA's Cooperative State Research, Education, and Extension Service.

"To succeed, environmentally sustainable systems have to be economically feasible."

The Hitts' ideas are shared by graduate student Heidi Rader, who is looking at how changes in technology, such as using high tunnels for season extension, can improve the economic and environmental viability of small-scale agriculture in Alaska. Her master's thesis advisor is SNRAS professor Meriam Karlsson, who specializes in controlled environment horticulture at the Agricultural and Forestry Experiment Station.

"Improved efficiency doesn't have to mean economies of larger scale, increased mechanization, higher chemical inputs, or genetically engineered crops," Rader said. "Lowering costs by decreasing dependence on fossil fuel can increase profit margins. A small farm might have an advantage over a large one if they incorporate new technologies, decrease distribution distances, and have a more direct relationship with the consumer.

In North Carolina, the Hitts grow 160 flower varieties and 80 kinds of vegetables on just three and a half acres. They sell most of their crops at farmer's markets and some to a few restaurants. Is this small, environmentally sound farm profitable? In his interview, Hitt said that if they aren't making $20,000 an acre, they change what they're doing.

To succeed, environmentally sustainable systems have to be economically feasible. Today, reductions in fossil fuel use are expected to contribute even more to farm viability and environmental sustainability. Sustainable farming methods include season extension techniques, alternative marketing and delivery systems, composting and crop rotations, reduced tillage systems, seed saving and heirloom crop varieties, and minimizing chemical fertilizer and pesticide use. "I want to find out how small improvements in technology, input levels, distribution channels, and marketing systems can alter the viability of small farming operations," Rader said.

For the past two summers, Rader has been using high tunnels set up at the Fairbanks Experiment farm to produce crops for her research. "High tunnels may be an affordable and practical solution to extend the short growing season in Alaska," she said, "The summer of 2006, when it snowed on June 4, is a perfect example of why high tunnels could help small farmers."

The temporary, quonset-style field greenhouses warm the air and soil, while allowing conventional field production, such as operating a tractor, weeding, and harvesting to continue.[2] Unlike traditional greenhouses, high tunnels are usually manually ventilated by opening the tunnel's sides and end walls. Drip irrigation, a popular method of watering in tunnels, is beneficial because it reduces the amount of water on leaves. Excess leaf moisture has been found to foster the spread of diseases and insects. Another benefit to high tunnels is that they are nontaxable because they are temporary and moveable.

"The warmer high-tunnel environment means faster crop development, earlier harvest, and creates potential for extended growth and production in the fall," Rader said. Other benefits include reduced damage from wind, rain, or hail, protection from too much moisture and related disease, improved produce quality, and less preparation for marketing.[3] In Saskatchewan, high tunnels are reported to pay for themselves after two to five growing seasons.[5]

"High tunnels might be especially profitable during the shoulder seasons when overall supplies are lower and farmers can charge a higher price. Extended vegetable production in Alaska will decrease the need for produce to be shipped from transnational and international sources," said Rader.

The round-style field greenhouse is a ClearSpan High Tunnel System with two bays (52 feet total width, 26 feet wide individual bays, 12 feet tall at the highest point and 48 feet long) covered with one layer of 6-mil polyethylene plastic that usually lasts three years. Drip tape was used for irrigation (T-Tape, T-Systems International, San Diego, California). Some beds are covered with embossed black plastic mulch for crops with higher soil temperature requirements. Low tunnels with a 1-mil perforated plastic were also used to strawberries in 2006. A lightweight fabrique material (Reemay) was used as row covers early and late in the season to protect crops from frost.

Raised beds are used for all crops in the tunnel and the field. The beds were made by a bed shaper and mulch layer (Model 94, Mechanical Transplanter Company, Holland, MI) that simultaneously applies drip tape. The beds are 24 inches wide and 5 to 6 inches tall.

Management of the high tunnel includes manually rolling up the sides for ventilation, using an electric Monitor

Heidi Rader tending peppers in one of her experimental plots. Note the raised beds: each are 24 inches wide and about 6 inches tall. The peppers are mulched with black plastic to warm the soil.
—photo by Mia Peterburs

heater for predicted episodic frosts, and drip irrigation to reduce weeds, keep produce clean, and mitigate the spread of diseases. Installing a high tunnel costs about $1.26 per square foot, including labor, compared to a simple quonset hut style greenhouse with automatic heating and ventilation, which costs about $7.62 per square foot.[5]

In routine census data, agriculture is often valued aspatially, but census data that correlates urban locations with agriculture have shown the importance of agriculture on the urban fringe. In Australia, three percent of the agricultural land base contributed twenty-five percent of the gross value of agriculture production.[6] This could have important implications for natural resources management in Alaska because urban populations often develop on prime agricultural land,[6] as seems to be the case with the Tanana Valley. High tunnels could increase spatial productivity of land on the urban fringe instead of requiring more acreage to be cleared to achieve similar yields.

"Direct marketing opportunities depend on a central and convenient location," Rader said. "By increasing spatial efficiency and crop dependability, the value of land for agricultural production may be sufficient to offset urban land prices."

A study of direct marketing for strawberries showed that convenience was the primary reason that 34 percent of first-time customers and 46 percent of repeat customers patronized a given location.[8] A study in Maine found that the majority of people surveyed at work had a high opinion of local agriculture, but would not sacrifice the convenience of one-stop shopping at a grocery store.[9] Thirty-nine percent of survey respondents said they would buy produce that was delivered to their work place.

Community Shared Agriculture (CSA) is a system built on a pre-season consumer commitment for regular, continuous deliveries as produce matures and is harvested over the summer.[10] The system has become an important outlet for direct marketing in the United States. In the Fairbanks area, there are several CSA farms in operation.

The CSA farmer benefits from loyal consumers, fixed prices, and pre-season capital. Customers appreciate the freshness, quality, quantity, and unique varieties of produce available through these operations. Although they are an important component of sustainable agriculture, they aren't always conducive to busy, modern lifestyles.[11] "More flexible CSA programs with less stringent time commitments and delivery schedules may attract more customers for locally grown produce," said Rader.

Rader is conducting her research at the University of Alaska Fairbanks Agricultural and Forestry Experiment Station. For the past two summers, she has maintained a high tunnel and field plots, less than one acre, that contain a variety of vegetables and culinary herbs, including some heirloom varieties.

To distribute research crops this summer, Rader set up a modified CSA for about twenty student customers. Each share was intended for two or three people and there were generally five to ten shareholders at any given time. By July 5 such crops as kale, onions, leaf lettuce, radishes, zucchini, summer squash, and various culinary herbs were distributed; additional types of radishes and culinary herbs were included by July 15; by August 15, cauliflower, broccoli, snap peas, carrots, leeks, beets, turnips, tomatoes, cucumbers, bell peppers, onions, and head lettuce were added; by August 18, there were sweet corn and snap beans. Tomatoes and cucumbers were grown in the Controlled Environment Agriculture Laboratory and the West Ridge Greenhouse using hydroponics techniques. "We also grew some produce that was provided weekly to the UAF catering operation, with the idea that some catering service will be provided in exchange," Rader said.

Rader reported her yields based on whether they were grown in the high tunnel or in the open field. Soil and air temperatures were monitored inside and outside the tunnel using Watchdog sensors, and precipitation was noted from the weather station at the Fairbanks Experiment Farm. The tunnel was generally at a few degrees higher temperature. In 2005, this was sufficient to protect the crops during the first hard frost of September 2. Concesa, a slender, small-seeded cultivar of snap bean, produced twice as much in the tunnel compared to the field. In contrast, there was no difference in yield for tunnel and field-grown Provider snap beans. Although Provider performs well and is recommended for colder regions, Concesa has higher fresh market quality with less fiber and better taste than the larger diameter pods of Provider. During the 2006 season, the high tunnel was especially beneficial because of the late spring and cool summer temperatures. The protection of the high tunnel during the many rainy days also contributed to higher quality produce and a more conducive environment for management and harvest.

Rader's research contributes to our understanding of factors involved in making the transition from conventional agricultural practices to more sustainable farming methods in Alaska. An article by Rader and Karlsson, "Northern Field Production of Leaf and Romaine Lettuce Using a High Tunnel," has been accepted for publication by the journal *HortTechnology*. Working with Rader and Karlsson on various aspects of this research and related studies were research professional Jeffrey Werner, research associate Terry Marsh, and student assistants Yosuke Okada, Kalan Paul, Mia Peterburs, Cody Peterson, and Wendy Langton.

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Links

Sustainable Agriculture Research and Education (SARE), USDA: www.sare.org/

Photos of the Hitt farm can be seen at the Chatham County Center, North Carolina Cooperative Extension website: http://chatham.ces.ncsu.edu/growingsmallfarms/hittmadden.html

Rader with a selection of vegetables grown in high tunnels and the field plots at the Fairbanks Exteriment Farm.
—PHOTO BY MIA PETERBURS

Tea time in southeast Alaska

Deirdre Helfferich

Blueberry, devil's club, fireweed, raspberry, roses: what does it take to turn wild herbs into tisanes, or herbal teas? Senior student Daniel Slakey based his thesis research on tea production, a fledgling Alaska industry that could become a strong contender in the nontimber forest products arena. Slakey, a natural resources management major, studied the feasibility of using a lumber drying kiln to process wild harvested plant materials. Alaska SuperNatural Teas of Haines, Alaska, cooperated with Slakey on his project, which resulted in the thesis: "Preliminary Investigation into the Use of a Dehumidifying Kiln for Drying Wild Herbal Teas in Southeast Alaska."

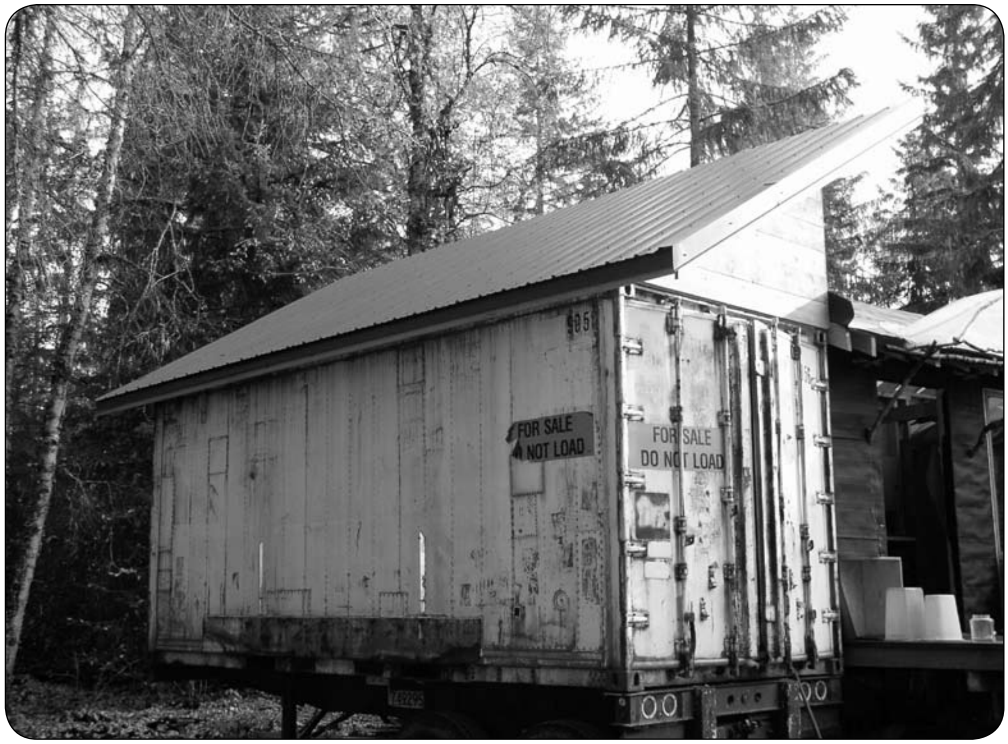
Alaska SuperNatural Teas, like many small enterprises in Alaska, relies on the rich natural resources of Alaska's forest landscape; nontimber forest resources are used for cosmetics, foods, dyes, artwork, and other products. The company makes herbal tea blends, among them Mountain Mint (mint, fireweed leaves and flowers, nettle, and goldenrod), Tonic (nettle, dandelion, strawberry and raspberry leaves, goldenrod, and chamomile), and Sweet Meadow (yarrow, rose leaves, petals and hips, dandelion, spruce tips, fireweed flowers, and strawberry leaf).

The SNRAS Sitka Forest Products Program explores ways to utilize the forest for new value-added products, timber-based or otherwise. To purchase a dehumidifying kiln for drying tea ingredients, Alaska SuperNatural Teas owner Erika Merklin, applied for and received a research grant from the SNRAS Sitka Forest Products Program, which explores ways to utilize the forest for new value-added products, timber-based or otherwise.

Wild rose leaves, petals, and hips are among the tea ingredients used in Slakey's herb-drying experiments.
—AFES FILE PHOTO

The Forest Products Program is working with Merklin to measure antioxidant levels in the dried herbs to determine the shelf life of teas and other products dried with the kiln, and is also analyzing the economics of a wild tea business, monitoring and tracking harvesting time in man-hours, associated costs such as electricity used, processing and drying times, and so on.

Merklin started her enterprise shortly after she moved to Haines in 1998, and made it into a formal business in 2001. She has been researching ways to improve the methods and equipment she uses, coordinating with the Forest Products Program since 2001.



Exterior view of the dehumidifying kiln used by Alaska SuperNatural Teas.
—PHOTO BY DANIEL SLAKEY

"I have worked with Erika Merklin for over two years now and find her to be energetic, hardworking, and tenacious. Against very strong odds, she's managed to put together a very nice business," said Valerie Barber, SNRAS research professor and forest products program director.

The two SNRAS students involved in the project have been instrumental in designing experiments, gathering information (and herbs), and providing analysis of the data. Slakey's thesis is on the herb drying, while Emily Dickson is researching how herb harvests affect the local forest.

"Working with senior thesis students Danny Slakey and Emily Dickson has been great. They are smart, hardworking, and can take the initiative and run with it," said Barber. "We have gotten a lot of great information out of the project to date on wet and dry weights and drying schedules for different plants and plant parts. When we get the antioxidant values back, I think we will have some great data of interest to many different groups and people in Alaska. I expect the values to be high in accordance with what others are finding in Alaska. We are also coming up with an economic model for a business such as Erika's which should help determine all costs associated with the business and show her where the break even point is and what her profits could be." Slakey's research on the dehumidifying kiln was the first step in this economics and practicum analysis.

The kiln

Dehumidifying kilns are normally used to dry lumber, and so, says Slakey, "the use of one for drying herbs can be considered a very experimental procedure." In his thesis, Slakey describes the way a dehumidifying kiln operates:

"The essential component of a dehumidification kiln is a dehumidifier, consisting of refrigeration coils on which water condenses from the moist air. The water then leaves the system, and dry air is re-circulated through the kiln, becoming moist as it passes over the wet product. The process of powering the refrigeration coils produces waste heat, which is utilized to heat the air in the kiln. In a conventional dryer, the moist air would be exhausted to the outdoors after having passed over the product, causing a great deal of heat loss. A typical practice for a conventional dryer of the design used in this experiment would be to recycle some of the air that has already been passed over the product. The basic design of the kiln is that of a cabinet or tray dryer, in which the food is placed on a large number of trays, and air is forced over or through the trays. One major problem with this type of dryer is that it can be very difficult to achieve uniform drying.… However, the cabinet or tray dryer is generally the most practical design for use in small-scale operations."

Herbs are dried in the kiln on trays arranged in racks designed to use the maximum feasible amount of space and to hold the plant material such that they will dry as evenly and efficiently as possible. Slakey experimented with spacing, angle to airflow, tray materials, uniformity of drying, material depth, efficiency, and the use of baffling and dry air deflectors to refine a design for drying racks and trays. He also looked at moisture content and determined drying schedules for different plant materials. He found that three factors were important to designing a kiln that was efficient and produced uniform results:

1) proper direction of airflow
2) maximizing space
3) minimizing electric costs

Slakey conducted a series of three design experiments. In the first experiment, he looked at drying uniformity and efficiency, using a relatively small amount of fireweed leaf in each tray. Although most industrial tray driers use racks made of metal, wooden racks have a lower initial cost. Although they may need to be replaced more often because of warpage due to frequent drying and re-absorbing of moisture, they are cheaper than any metal alternatives, and the small business owner can make them (as Slakey and Merklin did for these experiments). To study drying uniformity, Slakey tested the drying capacity of the tray drier and kiln by using fireweed leaf (it can be harvested the most quickly of the plants used by SuperNatural Teas). He calculated the percent loss of weight of the fireweed in each tray after a specific period of drying in the kiln, and created a chart showing position and value so he could see which areas of the kiln dried out the fastest (lower weights) and which dried the slowest (higher weights). Where drying was slow he assumed the area to have poor airflow, and associated high airflow with the areas that dried out faster. He modified the kiln to produce more even or faster drying after each test took place.

In the second and third experiments, Slakey worked out air baffling systems to direct airflow through the racks, repositioned the fans, and added a dry air deflector and an air intake disperser. These changes improved the drying uniformity. He also used about twice as much fireweed by weight as he did in the first experiment. However, the drying time required increased. The efficiency of the kiln needed to be improved.

The rack design proved to be an important factor affecting airflow, and hence efficiency. Slakey experimented with the number of rows of trays: doubling the number in each rack resulted in problems with drying uniformity: the top two rows always dried much faster than the other rows. Another problem drying the herbs evenly required turning or mixing the product so material in the interior did not mold or compost, and this was extremely difficult with ten rows: there was simply not enough space between rows. So Slakey compromised with seven rows of trays in each rack, and this provided enough vertical space between rows to turn the herbs. The extra rows increased the area available for drying by forty percent for each rack, making the kiln more efficient. The kiln was big enough to hold seven racks (the kiln is about the size of a largish van), but Slakey had only been using four, each with five rows of two trays. Seven racks, it turned out, was not feasible because of the placement of the kiln door, but six would fit and still provide room for a person to move around. Based on his experiments, Slakey came up with a recommendation for a kiln and rack design (see illustrations). Proper sealing of the dehumidifying kiln is also important to increase its efficiency.

Drying schedules

The main goal of the Sitka Forest Products Program grant was to determine appropriate drying schedules for the kiln. Drying schedules are important to determine the maximum drying rate with the least product damage for the least cost.

Inside the drying room, showing the drying rack in place. This rack used ten rows of trays, which proved to be too many; in a later design this was reduced to seven rows so that turning the trays would be easier.
—PHOTO BY DANNY SLAKEY

Typical herb drying takes two to three days. Slakey described three different stages in the drying process. These were: the initial stage, where water loss remains constant (water migrates to the material's surface as fast as it evaporates); a middle stage, where the internal moisture flow becomes the limiting factor in the drying process (the rate of water loss begins to decrease); and the final stage, where the food surface has become completely dry (the area of evaporation moves inward, and the drying rate becomes even slower). At a given temperature and relative humidity, a given food will have a certain equilibrium moisture content, above which it will gain moisture, and below which it will lose moisture. When these values are experimentally determined, one can plot them as water sorption isotherms. Each food product has a unique water sorption isotherm.

A fast drying rate decreases cost and also tends to increase product quality: if a plant is dried quickly, more nutrients and flavor are usually retained. Drying schedules include such things as time, temperature, relative humidity, turning frequency, and material thickness. The moisture content of a dried food product is very important to its integrity; if too high, it will get moldy or harbor bacteria or yeast. If herbs are dried for too long or at too high a temperature, they can turn brown, become too brittle, or lose their volatile oils. If they are dried incorrectly, the exterior of the material can harden and prevent interior moisture from escaping. (This can be avoided by drying the plant material rapidly in the early stages of the process, producing internal cracks and speeding up the later stages of drying.)

Slakey estimated the ideal moisture content of the final herbal tea to be between five and ten percent. Here are some of his observations on drying specific herbs:

"Based on the results of informal experiments involving material depth, it appeared that there are several factors which influence the ability of a material to dry successfully at a high

Species Name (Latin)	Sp. Name (common)	Material	MC (green basis)	N	Collection Dates
Achillea borealis Bong.	Common Yarrow	Flower	69.8 ± 0.38	3	07/11 – 08/08
Chamerion angustifolium (L.) Holub	Fireweed	Flower	79.15 ± 0.95	5	7/11 – 7/25
Rosa nutkana Presl	Rose	Petals	83.32	1	06/19
Trifolium pretense L.	Red Clover	Flower	78.75 ± 0.59	4	06/16 – 07/20
Arctostaphylos uva-ursi (L.) Spreng.	Kinnikinnick; Bearberry	Leaf	51.49 ± 1.5	10	08/06 – 09/14
Chamerion angustifolium (L.) Holub	Fireweed	Leaf	74.99 ± 3.51	7	06/03 – 07/20
Fragaria chiloensis (L.) Duchesne subsp. *pacifica* Staudt	Beach Strawberry	Leaf	64.01 ± 3.53	3	6/18 – 6/30
Ledum palustre L. subsp. *groenlandicum* (Oeder) Hult.	Labrador Tea	Leaf	53.09 ± 1.91	12	07/20 – 09/02
Matricaria matricarioides (Less.) Porter	Pineapple Weed	Herb	82.86 ± 1.53	4	07/20 – 08/08
Picea sitchensis (Bong.) Carr.	Sitka Spruce	New Spring Foliage	83.03	1	05/27
Rosa nutkana Presl	Rose	Leaf	61.47 ± 2.19	7	06/29 – 08/08
Rubus idaeus L. subsp. *melanolasius* (Dieck) Focke	Raspberry	Leaf	70.17 ± 3.48	6	07/15 – 07/20
Solidago decumbens Greene	Goldenrod	Leaf and Flower	69.78 ± 2.48	6	07/11 – 07/25
Taraxacum officinale Weber	Dandelion	Leaf	83.80 ± 1.09	10	05/24 – 06/01; 07/11 – 08/08
Urtica lyallii S. Wats.	Nettle	Leaf	82.50 ± 1.32	4	05/26; 07/01 – 07/13
Oploplanax horridus Miq.	Devil's Club	Inner Bark	63.79 ± 0.16	2	07/16
Viburnum edule (Michx.) Raf.	High Bush Cranberry	Bark	55.28 ± 1.33	4	07/15 – 07/26

Moisture content data for selected species in the Haines area, organized by which part of the plant was used. N = number of samples. Moisture content (MC) is determined according to the following equation: %MC (green basis) = (green weight – oven dry weight) / green weight) x 100

depth, including porosity and shrinkage during drying. Strawberry leaf, for example, essentially maintained its original shape throughout the drying process. The leaf's shape leads to a high porosity of the layer of leaves in a tray, so air can easily pass between throughout the process. Yarrow flowers are another example of a very porous material. The flowers are picked and dried in large inflorescences (group of flowers on a single stem), which contain a large amount of empty space. Like the strawberry leaf, the yarrow inflorescence maintains its original shape throughout the drying process, and air can easily move throughout the material on the tray.

"When dandelion and fireweed leaves are dried, they tend to lose their shape, and as they wither, they form a large mass, with wet material on the inside and dry material on the outside. Even with frequent turning, it is difficult to achieve a high-quality product. The solution is to first wither the leaves outside of the kiln so they won't form a single impenetrable mass, and they can be piled high without worry. Fireweed flowers, on the other hand, have a high bulk density and low surface area compared to most of the other plants in this study. This may have been the cause behind the difficulties in drying the flowers in thick layers. It seems unlikely that a pre-dry process could alleviate this problem, so it may be a good idea to use relatively thin layers of fireweed flower on the trays."

Pre-drying can help improve the quality of the final product and the efficiency of the drying process. Pre-dried herbs don't shrink as much in the kiln, so more volume of herbs can be placed in the drying racks without undue shrinkage. Pre-drying also is efficient, because it decreases kiln drying time. Erika Merklin is generally happy with the results. She said, "The kiln is working well for the final phase of drying (after the plants are air dried for a day) as the humidity of Southeast makes it difficult to get the moisture content low enough for storage."

Slakey discovered another problem in drying herbs:

"Drying time was essential to maintaining product quality. The most common difficulty faced with drying was consistency in drying among the various parts of the individual material. In dandelion, fireweed, and nettle leaf, for example, the leaf midvein consistently dried much more slowly than the leaf blade. In fact, the leaf blade would become very crispy and frail before the midvein showed signs of drying. This problem was dealt with by allowing the kiln to run for only six to twelve hours (depending on material depth, species used, etc.) on the first day, four to eight hours on the second day, and two to six hours on the third day. By spreading the drying process out in this manner, the different parts of the plant materials had a chance to equilibrate, so that no part became too dry and frail."

This solution introduced yet another problem: turning a kiln off and on during the drying cycle is not very efficient, since the kiln needs to be preheated each time it is started up.

Improving efficiency

To keep processing costs down, a business such as Super-Natural Teas must look at several factors: labor time and cost, electricity or fuel expenses, equipment costs, and materials costs. Slakey did not attempt to provide an economic analysis of the use of the dehumidifying kiln in his study, but with his redesign of the racks and experiments with pre-drying, he did find ways to decrease labor costs and allow more herbs to be dried. The insulation, sealing, and layout of the kiln is important.

"Ideally, opening of the door should be minimized, and the kiln should be symmetrical from left to right," he said. He also looked at electric use.

"Auxiliary heat was by far the most energy-intensive component of the kiln's electric cost," said Slakey, showing the importance of good insulation and sealing. "It also suggests other possible methods of reducing the cost of running the kiln." For most of the drying time, he said, "the refrigeration coils produce enough heat to eliminate the need for auxiliary electric heat." However, heating the kiln to a desirable temperature does require auxiliary heat.

To reduce the electricity costs, Slakey suggested using a heat source other than electricity, or that the kiln be operated continuously until materials are dry, if possible.

Determining precise drying schedules for each herb would increase the efficiency of the drying operation. Slakey determined moisture content for many of the herbs harvested. This is valuable, he says, because "By knowing approximately how much weight a given plant material will shrink as it goes through the drying process, one can figure out how much dry tea will be obtained from a harvested amount of green material."

To make the maximum use of this information, generating water sorption isotherms is required for each herb to determine the equilibrium moisture content of a material at a given relative humidity and temperature. This information allows the most precise control and most efficient kiln environment. Slakey found that the moisture content of most of the herbs gathered in the Haines area was too variable for creating drying schedules at this stage of research, but suggests that if the isotherms could be generated, then an automated drying method might be possible.

Until then, Slakey concluded, "alert monitoring" is important, and "likely to always be an important factor in successful tea drying. A dehumidifying kiln may have the potential to be economically viable in a small-scale Alaska herbal tea operation if it is designed and used efficiently."

As Dr. Barber pointed out, Slakey's experiments have already proved economically important to Alaska Super-Natural Teas: "This year [2006], the kiln was run much more efficiently and cost less to run than last year…predrying the plants and plant parts saved drying time." And there are other potential uses for the dehumidifying kiln, she added: "Erika took advantage of last year's fires in Haines and harvested quite a few morel mushrooms, using the kiln to dry them." Merklin hopes to expand her business, marketing at trade shows, improving her equipment and methods, and providing a locally made, nontimber forest product to her fellow Alaskans.

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Farm Use Lands exemption status program

http://www.co.fairbanks.ak.us/Assessing/
Karl McManus
907.459.1421

This state program, administered by the boroughs, gives preferential assessment with deferments on land assessed for farm use, resulting in potentially lower taxes for a business engaged in agricultural pursuits. The program goal is to preserve open space and encourage agriculture. The land must be actively engaged in horticultural or agricultural activity and includes greenhouse operators and businesses that are evaluated as "natural crops farms". There is an allowable startup time of one year. See Alaska Statute 29.45.060 Farm or Agricultural Land for the state's definition of "farm use", available on line at Alaska Legal Resource Center, http://touchngo.com/lglcntr/akstats/STATUTES/Title29/Chapter45/Section060.htm

UAF Sitka Forest Products Program

Valerie Barber, director
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The long-term objective of this program is to help Alaska become competitive in the value-added forest products industry by providing specific technical, business, and marketing assistance to Alaska's entrepreneurs.

Ericka Merklin, Cameron Bauer, and Tulsi harvesting fireweed.
—photo courtesty Alaska SuperNatural Teas

Daniel Slakey building drying racks.
—photo by Erika Merklin

Some Alaska companies using wild herbs:

Alaska Herb Tea Co.

herbtea@alaska.net
www.alaskaherbtea.com/
6710 Weimer Dr., Anchorage, AK 99502
Phone: 800.654.2764 or 907.245.3499
Fax: 907.245.3499

Alaska SuperNatural Teas

aksupernaturalteas@yahoo.org
Erika J. Merklin
2618 Chilkat Lake Rd., Haines, AK 99827
Phone: 907.767.5586

Raven Moon Farm

www.ravenmoonfarm.com
ravenmoonfarm@acsalaska.net
Sarah Drew
PO Box 84928, Fairbanks AK 99708
Phone: 907.457.1991

This is a "natural crops farm"; the owner makes cosmetics and other products using wild and cultivated domestic herbs on the property.

WinterSong Soap Company

wintersongsoap@att.net
www.wintersongsoap.com
PO Box 1191, Sitka, AK 99835
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